Stock Market Consolidation: Implications for Market Integration, Diversification Benefit and Home Bias

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List of Abbreviations

Abbreviation	Full Name
AREAER	Annual Report on Exchange Arrangements and Exchange Restrictions
ASEAN	Association of South East Asian Nations
ATL	ASEAN Trading Link
BI	Borsa Italiana (Italian Stock Exchange)
CEESEG	Central and Eastern Europe Stock Exchange Group
CPIS	Coordinated Portfolio Investment Survey
CSE	Copenhagen Stock Exchange
DB	Diversification Benefit
DCC-MGARCH	Dynamic Conditional Correlation Multivariate Generalized Autoregressive Conditional Heteroskedasticity
EM	Emerging Markets
EMU	European Economic and Monetary Union
EU	European Union
HB	Home Bias
HEX	Helsinki Stock Exchange
ICAPM	International Capital asset Pricing Model
IMF	International Monetary Fund
LSE	London Stock Exchange
M&A	Merger and Acquisition
MI	Stock Market Integration
MILA	Latin America Integrated Market
MSCI	Morgan Stanley Capital International
NASDAQ	National Association of Securities Dealers Automated Quotations
NYSE	New York Stock Exchange
OLS	Ordinary Least Square
OM	Stockholm Stock Exchange
SC	Standard Correlation
UK	United Kingdom
US	United States
WDI	World Development Indicator

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Abstract

In the last three decades, many stock markets around the world have consolidated their trade platforms or signed agreements to facilitate cross-country investments. The objectives of this study are to investigate the effect of stock market consolidation on (i) the stock market integration (MI) (ii) diversification benefit (DB) and (iii) equity home bias (HB) controlling for numerous economic and stock market characteristics. We distinguish two stages of market consolidation into (i) an announcement stage and (ii) an implementation stage. The samples include 22 stock markets under six stock market consolidation groups during the year 2000-2016. We use Ordinary Least Square (OLS) panel regression as a tool to examine this effect.

First, the stock market consolidation successfully increases the MI both in the announce and implement stage. The effect of the announcement is larger than of the implementation. We also found that financial crisis, exchange rate risk, stock market performance, real convergence and monetary policy convergence are also important factors that impact MI.

Second, the stock market consolidation decreases the US investors diversification benefit among the consolidation groups that include US stock markets. On the other hand, the US DB still exist among the consolidation groups that exclude US markets. We also found that financial crisis, exchange rate risk, stock market performance, real convergence and monetary policy convergence are also important factors that affect DB.

Finally, the stock market consolidation does not have a significant effect on US investors equity home bias towards the consolidation groups that include US markets. In addition, the stock market consolidation even increases US home bias toward the consolidation groups that exclude US markets. We also found that governance, indirect cost of investment, direct cost of investment, incentive of investment, financial crisis, and size are also important factors that impact HB.

Keywords: Stock Market Consolidation; Stock Market Integration; Diversification Benefit; Equity Home Bias

Chapter 1: Introduction

In the last three decades, many stock markets around the world have consolidated in order to trade under the same platform or signed an agreement to facilitate cross-country investments. It is often argued that stock market consolidation is beneficial for countries undertaking it as the stock market consolidation removes investment barriers and decreases transaction costs of investments. This in turn, gives the consolidated markets more opportunity to diversify investments and attract a wider range of investors than if the markets traded and operated in separation. Consolidation also can benefit countries that are not directly members of a consolidated group. This is because, consolidated markets, being bigger and more regulated, may be expected to improve their transparency, liquidity and efficiency of various types. Thus, it can be expected that a consolidated market will be more attractive to foreign investors than a set of small and fragmented pre-consolidation markets. International portfolio diversification is commonly believed to be beneficial (Solnik 1974; Stulz 1999).

Stock markets are considered to be fully consolidated when all the stock markets within the consolidation group face the same set of rules and have equal access when trading financial instruments and are treated equally when they are active in the market (Baele et al. 2004; Schmiedel and Schönenberger 2005). Cybo-Ottone et al. (2000) have classified four main stock market consolidation criteria. Firstly, it can be classified by the legal structure or vehicle used including merger or acquisition of control, long-term contracts for the supply of technology or any kind of collaboration, joint venture using some types of common vehicle, and the creation of the new market. Secondly, it can be classified by the types of technological integration including an outsourcing of information technology, a common access to previously separated trading platform and a unique access to a single merged platform. Thirdly, classification by the implementation status including the negotiation of the deal, the announcement of the deal, the implementation of the deal and the drop of the deal. Finally, the stock market consolidation can be classified by the geographic location involved including domestic where the stock markets in the deal are located in the same country and cross-country where the stock markets are located in different countries.

While there are previous studies investigated the factors that cause successful stock market consolidation (Dorodnykh 2014), there are exceptionally scant studies investigating the

consequences of such consolidation. In this study, we empirically examine the effect of the stock market consolidation on the stock market integration, diversification benefit and home bias.

1.1 Research Question and Scope

This study focuses on cross-country stock market consolidation as we would like to see the effect regarding capital flows across the country. We choose two stages of stock market consolidation from the implementation status criteria. The first stage is the announcement stage (ANNOUNCE), i.e. the period from the day when an official statement has been made about what markets, in what form and when are going to consolidate, till the physical implementation of consolidation. The second stage is referred to as the period of physical implementation (IMPLEMENT). This stage starts on the day of the launch of the common trading platform or when the agreement that facilitate cross-country trading comes into effect and ends at the end of our sample.

Our sample comprises of stock markets around the world that undertook stock market consolidations between 2000 and 2016. These are New York Stock Exchange-Euronext (NYSE-EURONEXT), NASDAQ-OMX, London Stock Exchange-Italian Stock Exchange (LSE-BI), Central and Eastern Europe Stock Exchange Group (CEESEG), Latin America Integrated Market (MILA) and ASEAN Trading Link (ATL).

In this study, we examine the effect of the stock market consolidation on stock market integration (MI), diversification benefit (DB) and the home bias of equity investment (HB). MI is stock market integration index derived from the correlation between the stock market index return. DB is the correlation-based diversification benefit index and HB is the equity investment home bias which represents the degree that investors bias their equity investment toward their home rather than diversifying abroad.

1.1.1 Stock Market Consolidation and Stock Market Integration

Stock market consolidation is important to both policymakers and market participants. In consolidated markets, capital flows freely to the place that generates the highest return. Market participants would have easier access to foreign capital but are more vulnerable to financial crises that occur in the other part of the world. The stock market consolidation plan

is believed to increase the degree of MI which will eventually decrease the diversification benefit. Therefore, it is important to achieve a better understanding of how the stock market consolidation event affect the degree of MI.

Many studies have examined the development of MI over time (Hwang 2012; Kolluri et al. 2014; Pukthuanthong and Roll 2009; Bit-kun et al. 2015; Dimitriou and Simos 2013). However, only few authors investigated the factors driving such integration such as the impact of European political and economic integration on European MI (Kim et al. 2006; Buttner and Hayo 2011; Dimitrios and Simos 2011; Boubakri and Guillaumin 2011).

Previous literatures used different methods to measure the degree of MI. Early literature used Johansen's cointegration and Granger causality test to find the degree of MI among the group of countries in a specific period (Arshanapalli et al. 1995; Click and Plummer 2005; Lim 2009; Azali et al. 2010). However, this approach has been criticized for being a static approach that cannot capture the dynamic of MI (Kearney and Lucey 2004; Kim et al. 2006). Later on, many studies started to apply the dynamic measure of MI to track the development of MI over time such as rolling standard correlation (SC) and heteroskedasticity-adjusted correlation-based measures.

Since there is an ongoing debate whether SC is a robust measure of integration, heteroskedasticity-adjusted correlation-based measures such as the dynamic conditional correlation Multivariate Generalized Autoregressive Conditional Heteroskedasticity model (DCC-MGARCH) proposed by Engle and Robert (2002) are widely used. The advantage of using the heteroskedasticity-adjusted correlation-based measures is that it can produce a numeric measure and can capture the dynamic process of the correlation in a bilateral setting.

In this study, we use DCC-MGARCH between the stock market index return to measure the MI index because we would like to investigate the degree of bilateral stock market integration in a dynamic process. We will also use SC as a robust measure of MI. The scope of this empirical essay is to investigate MI using the sample of 20 stock markets in 19 countries around the world that experienced the stock market consolidation during the year 2000-2016.

The objectives are 1) to compare MI between six stock market consolidation groups 2) to compare mean MI in different stages and 3) to examine the factors affecting MI especially the effect of different stages of the stock market consolidation on MI controlling for numerous economic and stock market characteristics.

1.1.2 Stock Market Consolidation and Diversification Benefit

As mentioned earlier, the stock market consolidation plan is believed to increase the degree of MI which will eventually decrease the diversification benefit (DB). Therefore, it is also important to achieve a better understanding of how the stock market consolidation event affect the degree of DB.

Many studies have examined the development of DB over time (Christoffersen et al. 2014; Miralles-Marcelo et al. 2015; Thanakijsombat and Kongtoranin 2018; Meric et al. 2008; Meric et al. 2011; Statman and Scheid 2008; Delcoure 2010). However, only a few studies look at the factors that drive DB (Lee et al. 2016; Cotter et al. 2018). Correlation-based DB is widely used by the previous literature (Bekaert and Harvey 1995; Grubel 1968; Lessard 1973; Harvey 1995). Christoffersen et al. (2014) argue that use the heteroskedasticity-adjusted correlation-based measure DCC-MGARCH is a more accurate measure of DB comparing to rolling SC as it does not depend on the rolling window.

In this study, we use DCC-MGARCH between the stock market index return to measure DB index. We will also use SC as a robust measure of DB. The objective of this empirical essay is to focus on US investors diversification benefit toward 18 destination countries around the world that experienced stock market consolidation during the year 2000-2016. US investor is chosen because US is part of two stock market consolidations under the period of study. Thus, choosing the US as a home country can distinguish between the effect of the attractiveness of the destination countries consolidation group and the ease of being under the same stock market consolidation group.

The objectives are 1) to compare US DB between six stock market consolidation groups 2) to compare mean US DB in different stages and 3) to examine the factors affecting US DB especially the effect of different stages of the stock market consolidation on US DB controlling for numerous economic and stock market characteristics.

1.1.3 Stock Market Consolidation and Home Bias

The stock market consolidation plan is believed to decrease the degree of equity home bias (HB) as it is easier for investors to buy equity across country. From the policymaker perspective, lower HB means investors are willing to decrease their portfolio weight toward the domestic country and increase diversification opportunity abroad. Therefore, it is important to achieve a better understanding of how the stock market consolidation event affect the degree of HB.

Early studies have observed the so-called "HB puzzle" or the phenomenon where the domestic investors tend to outweigh domestic investment comparing to foreign investment (French and Poterba 1991; Cooper and Kaplanis 1994; Bekaert and Harvey 1995; Chan et al. 2005). Many studies tried to solve this puzzle by investigating the factors driving HB (Daly and Vo 2013; Mishra 2008; Mishra 2014; Dahlquist et al. 2003; Fidora et al. 2007; Chan et al. 2005; Ahearne et al. 2004). However, to the best of our knowledge, none of the previous literature has looked at the effect of the stock market consolidation on HB.

Previous literatures widely used International Capital Asset Pricing Model (ICAPM) to calculate optimal portfolio weight due to its simplicity in term of calculation and interpretation (Baele et al. 2007a; Daly and Vo 2013; Dahlquist et al. 2003; Fidora et al. 2007; Chan et al. 2005; Ahearne et al. 2004). ICAPM assumes that the optimal weight of domestic investor's foreign securities holding equals to the weight of each country market capitalization in the world market capitalization. However, Mishra (2008) and Mishra (2014) argue that the ICAPM home bias measure should be adjusted by the number of float share available to trade in each country.

In this study, we will use the ICAPM optimal portfolio weight to investigate the US HB toward 22 destination countries around the world that experienced stock market consolidation during the year 2001-2016. Float-adjusted ICAPM HB will be used as a robust measure of HB. US investor is chosen because the US is part of two stock exchange consolidations during that period. Thus, choosing the US as a home country can distinguish between the effect of the attractiveness of the destination countries consolidation group and the ease of being under the same stock market consolidation group.

The objectives are 1) to compare US HB between six stock market consolidation groups 2) to compare mean US HB in different stages and 3) to examine the factors affecting US HB especially the effect of different stages of the stock market consolidation on US HB controlling for numerous economic and stock market characteristics.

1.2 Motivation and Relevance

In a fragmented market, there are barriers between stock markets such as the limit of amount of investment between countries and high brokerage fees. Cross-country stock market consolidation is relevance to policymakers, fund manager and individual investors as it directly removes or lowers these barriers to facilitates cross-border equity market investment which increases the chance of diversification.

The first empirical essay of stock market consolidation and MI is particularly relevant for policymakers. They can see the degree of MI in different region around the world over time and the effect of the stock market consolidation on MI as well as the other factor that affect MI. The results of this essay give policymakers crucial information that helps them making any further policy decision regarding stock market consolidation.

The second empirical essay of stock market consolidation and DB is particularly relevant for US fund manager and US individual investors. They can see the degree of US DB toward different countries around the world over time and the effect of the stock market consolidation on DB as well as the other factor that affect DB. The result of this essay gives the US fund manager and US individual investors important information that helps them making investment decision especially during the period of the stock market consolidation.

The third empirical essay of stock market consolidation on HB is particularly relevant for the US policymakers. They can see the degree of US HB toward different countries around the world over time and the effect of the stock market consolidation on HB as well as the other factor that affect HB. The results of this essay give policymakers crucial information that helps them making any further policy decision regarding stock market consolidation.

The first empirical essay uses the data of the stock markets from different countries around the world, so it is not US-centric. Therefore, we can generalize from result of this essay if the stock market consolidation significantly increases the stock market integration index (MI).

However, the second and third empirical essays use the data based on the US investors perspective. Therefore, we can generalize the findings of these two chapters for other countries with similar level of the development reflected by macro variables such as the variables used as independent variables in the studies. For other emerging countries with different level of development, it is more difficult to generalize these findings. Therefore, we leave it for future study to look from the perspective of emerging markets.

1.3 Summary of Findings and Main contributions

First, the stock market consolidation successfully increases MI both in the announce and implement stage where the effect of the announcement is larger than that of the implementation. Financial crisis, exchange rate risk, stock market performance, real convergence and monetary policy convergence also significantly affect MI.

Second, the stock market consolidation decreases the US DB among the consolidation groups that include US stock markets. However, the US DB still exist among the consolidation groups that exclude US markets. The result implies that the US markets are more integrated with its own consolidation group but less integrated with others. Financial crisis, exchange rate risk, stock market performance, real convergence and monetary policy convergence are also important factors that affect DB.

Finally, the stock market consolidation does not have a significant effect on US HB towards the consolidation groups that include US markets. Besides, the stock market consolidation even increases US home bias toward the consolidation groups that exclude US markets. We also found that governance, indirect cost of investment, direct cost of investment, incentive of investment, financial crisis, and size are also important factors that impact HB.

Following the result, policymakers should urge to consolidate the stock markets so that the investors are more facilitated to decrease home bias and increase diversification benefit. From the fund manager and investors perspective, investors should decrease their home bias and invest more in the consolidation group that excludes their domestic stock market to gain diversification benefit.

1.4 Thesis Structure

The remainder of this thesis is structured as follows. Chapter 2 is the background of the stock market consolidation. Chapter 3 provides a literature review and hypothesis development. Chapter 4 shows the first empirical essay of stock market consolidation and stock market integration. Chapter 5 is the second empirical chapter of stock market consolidation and diversification benefit. Chapter 6 reveals the third empirical chapter of stock market consolidation and home bias and Chapter 7 concludes.

Chapter 2: Background of Stock Market Consolidation

2.1 Stock Market Consolidation Motivation

The motivation behind the stock market consolidation can be explained by merger and acquisition (M&A) theory of efficiency theory and synergy gain theory. According to the efficiency theory, companies went through M&A to enhance efficiency by taking advantage of specialized skills, sharing technologies and reducing transaction cost (Wolfe et al. 2011). Similar to firm-level M&A, stock market consolidation through M&A also aims at enhancing efficiency through the same channel. The fully consolidated stock markets are expected to share specialized skills and advance technology; thus, reducing the transaction cost of investment.

According to the synergy gain theory, companies went through M&A to gain benefit from synergy through economies of scale of operation where fixed cost is reduced due to larger scale of production and economies of scope where the two companies combine complementary resources (Leepsa and Mishra 2016). This motivation is also applied to the stock market consolidation where the fixed cost due to the common trading platform is distributed among the stock markets that are member of the consolidation group to achieve economies of scale. In addition, each stock markets can combine possible complementary resources to achieve economies of scope.

2.2 Challenges of Stock Market Consolidation

There are three main challenges of the stock market consolidation. Firstly, there are many complicated processes from the negotiation to the complete of the deal. When the deal is not satisfied by the two stock markets, there is a high chance that the deal will be dropped and the consolidation of the two markets are abandoned. Secondly, there is a high difference in the level of development of the two stock markets. It would be very difficult for the two stock markets to consolidate if they currently have different level of transparency, apply different rules and regulation and different technology. Finally, the complete of the deal is subject to the Anti-Monopoly Act where the consolidated markets should not be too big that it can dominate the market share of the stock markets around the world.

2.3 Stock Market Consolidation Categories

Cybo-Ottone et al. (2000) have classified stock market consolidations into four main categories. Firstly, it can be classified by the legal structure or vehicle used including merger or acquisition of control, long-term contracts for the supply of technology or any kind of collaboration, joint venture using some types of common vehicle, and the creation of the new market. Secondly, it can be classified by the types of technological integration including an outsourcing of information technology, a common access to previously separated trading platform and a unique access to a single merged platform. Thirdly, classification by the implementation status including the negotiation of the deal, the announcement of the deal, the implementation of the deal and the drop of the deal. Finally, the stock market consolidation can be classified by the geographic location involved including domestic where the stock markets in the deal are located in the same country and cross-country where the stock markets are located in different countries.

From the cross-country perspective, different forms of stock market consolidations are cross-border mergers, cross-remote membership, cross-listing, implicit merger and other alliances (Serafie and Shahid 2002). Cross-border mergers are cross border deals for the supply of technology or collaboration of any kinds between two stock markets in different countries. Cross-remote membership is when an exchange gives access via electronic circuit where brokerage firms and investment house can trade on the same stock market even if they are physically located in different countries. Cross-listing is when companies cross-list their stock in foreign stock markets to allow foreign investors to trade as if they were domestic stocks. Implicit merger is an agreement between two exchanges where stocks originally listed on one stock market are listed by the other market and traders of both exchanges is offered with remote access to trade stock. Other alliances are any other forms of agreement between stock markets.

2.4 Sample of Stock Market Consolidations

Since we would like to see the effect regarding capital flows across the country, this study focuses on cross-country stock market consolidation but not on domestic mergers. The focus time period of this study from 2000 to 2016 is the time period when the stock market consolidations are implemented by a large number of stock markets around the world and most of the macro variables data used as control variables in this study are available on a

monthly basis starting from the year 2000 onward. During the focus time period, there are altogether six cross-country stock market consolidations. These are New York Stock Exchange-Euronext (NYSE-EURONEXT), NASDAQ-OMX, London Stock Exchange-Italian Stock Exchange (LSE-BI), Central and Eastern Europe Stock Exchange Group (CEESEG), Latin America Integrated Market (MILA) and ASEAN Trading Link (ATL).

EURONEXT is the first pan-European exchange, spanning Belgium, France, the Netherlands and Portugal. It is the exchange networks that operate four national regulated securities markets in Amsterdam, Brussels, Lisbon and Paris. In September 2000, Amsterdam, Brussels and Paris stock exchange merged. In February 2002, the Euronext platform expanded to include the Lisbon exchange. In November 2003, all those stock exchange started to have common trading and clearing systems. Euronext uses a single order book to combine the liquidity of four markets, allowing investors to trade, clear and settle in a uniform way. In June 2006, the New York Stock Exchange (NYSE) and EURONEXT merged to create a Euro-American multinational financial services, the NYSE-EURONEXT group. In April 2007, NYSE-EURONEXT started trading under the same platform.

In May 2003, Stockholm Stock Exchange (OM) announced to merge with Helsinki Stock Exchange (HEX) and Estonia stock exchange to form a joint company OM HEX in order to create an integrated Nordic and Baltic market for listing, trading, clearing, settlement and depository of securities. In September 2004, the OM HEX brand name was changed to OMX and the stock exchange started to trade under the same platform. On November 2004, OMX and Copenhagen Stock Exchange (CSE) announced to combine the operations of the two companies. The OMX then acquired the CSE and the Iceland Stock Exchange in February 2005 and December 2006 respectively. In May 2007, NASDAQ announced to buy OMX. The acquisition was done in February 2008 and the NASDAQ-OMX Group was created. NASDAQ-OMX had a common trading platform across the stock exchange under its ownership.

In June 2007, The London Stock Exchange (LSE) announced its takeover with Borsa Italiana (BI), the Italian Stock Exchange. The deal was completed in October 2007 and the fusion between British and Italian stock markets occurred (LSE-BI). In November 2008, Wiener Borse AG who operates the Vienna Stock exchange announced the acquisition of majority stakes in Ljubljana's and Prague's stock exchanges and became the largest exchange

presence in eastern Europe. In September 2009, the Central and Eastern Europe Stock Exchange Group (CEESEG) was established, comprising the Budapest, Ljubljana, Prague, and Vienna stock exchanges. In January 2010, all four stock exchanges started to trade under the same platform.

In September 2009, Peru, Colombia and Chile stock exchanges announce to merge to create the single trading platform Mercado Integrado Latino Americano (MILA), the largest Latin America market in terms of listed companies, and the second-biggest stock market in terms of capitalization after the Brazilian stock exchange. MILA began operating on May 2011 where investors and brokers from Chile, Colombia and Peru can now purchase and sell shares from the three stock markets through a local broker. In July 2014, Mexican Stock Exchange officially joined MILA, making the first transaction with the market in December 2014.

In April 2011, during the Association of South East Asian Nations (ASEAN) meeting, the ASEAN exchanges market project timeline was announced. On September 2012, the ASEAN Exchanges collaboration launched the ASEAN Trading Link (ATL), a gateway for securities brokers to offer investors easier access to connected exchanges. Bursa Malaysia and Singapore Exchange were the first two exchanges to join the link on the launch day, while The Stock Exchange of Thailand joined on October 2012. The connection of the three exchanges was the agreement of broker-to-broker with no common trading platform.

Table 2.1 summarizes the timeline for the stock market consolidation announcement and implement date for each sample stock market indices under each consolidation group. We identify ANNOUNCE and IMPLEMENT from researching the stock market consolidation official website.

Table 2.1 The Sample Stock Market Consolidation Announcement and Implement Date

Consolidation Group	Stock Market Index	Announcement	Implement
NYSE-EURONEXT	Amsterdam Stock Exchange (Netherland)	September 2000	November 2003
	Brussels Stock Exchange (Belgium)	September 2000	November 2003
	Paris Stock Exchange (France)	September 2000	November 2003
	Lisbon Stock Exchange (Portugal)	February 2002	November 2003
	NYSE (USA)	June 2006	April 2007
NASDAQ- OMX	Stockholm Stock Exchange (Sweden)	May 2003	September 2004
	Helsinki Stock Exchange (Finland)	May 2003	September 2004
	Estonia Stock Exchange (Estonia)	May 2003	September 2004
	Copenhagen Stock Exchange (Denmark)	November 2004	February 2005
	Iceland Stock Exchange (Iceland)	September 2006	April 2007
	NASDAQ (USA)	May 2007	February 2008
LSE-BI	London Stock Exchange (UK)	June 2007	October 2007
	Italian Stock Exchange (Italy)	June 2007	October 2007
CEESEG	Budapest Stock Exchange (Hungary)	November 2008	January 2010
	Ljubljana Stock Exchange (Slovenia)	November 2008	January 2010
	Prague Stock Exchange (Czech Republic)	November 2008	January 2010
	Vienna Stock Exchange (Austria)	November 2008	January 2010
MILA	Lima Stock Exchange (Peru)	September 2009	May 2011
	Colombia Stock Exchange (Colombia)	September 2009	May 2011
	Chile Stock Exchange (Chile)	September 2009	May 2011
	Mexican Stock Exchange (Mexico)	July 2014	December 2014
ATL	Bursa Malaysia (Malaysia)	April 2011	September 2012
	Singapore Exchange (Singapore)	April 2011	September 2012
	Stock Exchange of Thailand (Thailand)	April 2011	October 2012

Note: Table 2.1 summarizes the timeline for the stock market consolidation announcement and implement date for each sample stock market indices under each consolidation group.

Chapter 3: Literature Review and Hypothesis Development

3.1 Review of Theories

Portfolio theory is the basis theory for the whole thesis because we focus on the portfolio equity investment across country. For essay 1 and 2, portfolio theory explains why correlation can be used to measure both the stock market integration and diversification benefit. For essay 3, portfolio theory shows that investors can apply the portfolio allocation by putting the weights for each asset. For essay 3, International Capital Asset Pricing Model (ICAPM) is the basis theory as it develops on the portfolio theory by suggesting the optimal portfolio weights for the world market portfolio.

3.1.1 Portfolio Theory

Markowitz (1952) developed the modern portfolio theory from a standard mean-variance framework. He shows how to achieve optimal portfolio based on expected return, variance and the covariance of securities' return. Markowitz used mathematical methods to explain that the portfolio risk reduces by adding securities that are less than perfectly correlated to a portfolio. For the sake of simplicity, he shows that the portfolio risk reduces when two assets that are not perfectly correlated are added to a portfolio. For two assets, portfolio return and standard deviation can be computed from the equation **(3.1)** and **(3.2)**

$$\boldsymbol{R_P = W_A R_A + W_B R_B} \qquad \textbf{(3.1)}$$

$$\boldsymbol{\sigma_P = \sqrt{W_A^2 \sigma^2(R_A) + W_B^2 \sigma^2(R_B) + 2 W_A W_B r_{AB} \sigma(R_A) \sigma(R_B)}} \qquad \textbf{(3.2)}$$

where R_P is the return of the portfolio of asset A and asset B, σ_P is the portfolio risk measured by standard deviation of the portfolio of asset A and asset B, W_A is the weight invest in asset A, W_B is the weight invest in asset B where W_A and W_B sum to 1, R_A is the return of asset A, R_B is the return of asset B and r_{AB} is the correlation coefficient of asset A and B return. Equation **(3.1)** shows that the portfolio return is the weighted average of the asset returns. According to equitation **(3.2)**, he demonstrates that portfolio risk is not only influenced by the individual variances of the assets return, but also by the degree of the correlation of the assets. The correlation coefficient ranges from -1 to 1 where a correlation of 1 or perfect correlation means that two asset returns vary in exactly the same way. Investors can reduce portfolio risk through diversification by adding more assets that are less than perfectly

correlated to a portfolio. Including such assets to the portfolio will cause the average covariance of the portfolio to decline which causes the portfolio standard deviation to also decline.

3.1.2 International Capital Asset Pricing Model (ICAPM)

Capital Asset Pricing Model (CAPM) suggests that the expected return on a security is equal to the risk-free rate plus a risk premium (Sharpe 1964; Lintner 1965; Mossin 1966). The International Capital Asset Pricing Model (ICAPM), an international setting of CAPM, takes into account exchange rates (Solnik 1974; Sercu 1980). The ICAPM formula is shown in equation **(3.3)**

$$\boldsymbol{R_i = R_f + \beta_1(R_M - R_f) + \beta_2(FCRP)} \quad \textbf{(3.3)}$$

where R_i is the country i's market portfolio required rate of return. R_M is the world market portfolio return. R_f is the world risk-free rate and $FCRP$ is the foreign currency risk premium. β_1 is the world systematic risk calculated from equation **(3.4)**

$$\boldsymbol{\beta_1 = \frac{Cov\,(R_i, R_M)}{\sigma_M^2}} \quad \textbf{(3.4)}$$

where $Cov\,(R_i, R_M)$ is the covariance between the country i's market portfolio return and the world market portfolio return and σ_M^2 is the variance of the world market portfolio return. According to equation **(3.3)**, the risk premium is divided into the global market risk premium and the foreign currency risk premium. Equation **(3.4)** shows that the global market risk premium depends on the covariance of that country's market portfolio return with the world market portfolio return. If the covariance is high, the market portfolio of the country is risky from the perspective of global markets. The systematic risk (β_1) is the uncertainty of macroeconomic factors that affect all risky assets and is the type of risk that cannot be diversified away. Unsystematic risk is a country-specific risk which can be diversified away by adding more assets that are not perfectly correlation to the portfolio (Markowitz 1952; Markowitz 1959).

The ICAPM assumes that the world is perfectly integrated, the law of one price holds universally and markets clear. Lintner (1965) demonstrates that according to CAPM the average mean-variance investor holds the market portfolio. In an international setting, Cooper and Kaplanis (1986) treat the world market as a mixture of national portfolios. ICAPM implies that all investors hold the world market portfolio; therefore, the optimal investment weights of a country according to ICAPM are given by the relative shares of domestic and foreign equities in the world market capitalization (Cooper 2013; Baele et al. 2007; Mishra 2015).

3.2 Stock Market Integration

From the literature review, we would like to summarize the stock market integration literature from the three main perspectives. Firstly, stock market integration measure including the pros and cons of the measures. Secondly, the stock market integration empirical works of different countries in different region around the world over time. Finally, the determinants of the stock market integration.

3.2.1 Stock Market Integration Measure

The stock market integration indicators can be classified into the price-based indicators where the analysis is based on the stock market price index and the quantity-based indicators where the analysis is based on the international capital flow (Billio et al. 2017). Most of the previous studies apply the price-based indicators instead of the quantity-based one due to more data availability and reliability and better economic meaning (Adam et al. 2002). Since price-based indicators follow the law of one price, it is easier to interpret the result of the integration comparing to the quantity-based indicators which do not follow the law of one price (Volosovych 2011). Our study follows this strand of the literature and applies the price-based indicators as a measure of the stock market integration. **Table A-1** in **Appendix A** compares the difference between the price-based and quantity-based indicators.

Previous literatures used different methods to measure the degree of MI relying on price-based indicators. Early literature used static approach such as Johansen's cointegration and Granger causality test to find the degree of MI among the group of countries (Arshanapalli et al. 1995; Click and Plummer 2005; Lim 2009; Azali et al. 2010). Despite the fact that it is the simplest approach in terms of computation, cointegration method has a major drawback of not being able to produce a numerical measure of MI where the speed of adjustment in the error correction model only tell the speed of adjustment to long-run equilibrium but not the numerical degree of MI. Furthermore, this approach has been criticized that it cannot capture the dynamic of MI (Kearney and Lucey 2004; Kim et al. 2006).

As it is generally accepted that integration is a dynamic concept, we only consider methodologies that allow us to capture the degree of MI over time. The standard correlation (SC) is one of the most widely used methodology to measure MI (Kearney and Lucey 2004).

Many studies used rolling SC to measure dynamic of MI (Goetzmann et al. 2004; Quinn and Voth 2008). The pro of this approach is that it is easy to calculate, and the interpretation is straightforward. However, some studies argue that SC is not a robust measure of integration as conclusions about MI drawn from correlations may be biased by the conditional heteroskedasticity of market returns (Pukthuanthong and Roll 2009; Bekaert et al. 2009; Volosovych 2011).

To correct for such bias, heteroskedasticity-adjusted correlation-based measures such as the dynamic conditional correlation multivariate generalized autoregressive conditional heteroskedasticity model (DCC-MGARCH) proposed by Engle and Robert (2002) are widely used (Buttner and Hayo 2011; Guesmi et al. 2006; Guesmi and Nguyen 2014; Guesmi et al. 2014; Kim et al. 2006; Hwang 2012; Kolluri et al. 2014). The advantage of using the DCC-MGARCH is that it is not subject to the bias by the conditional heteroskedasticity of market returns and it is a numeric measure that can capture the dynamic process of the correlation in a bilateral setting.

In this study, we use DCC-MGARCH to measure heteroskedasticity-adjusted MI to investigate the degree of bilateral stock market integration in a dynamic process. We will also use SC between the stock market index return as a robustness check for MI.

3.2.2 Stock Market Integration Empirical Work

Many studies found an increasing trend in regional MI for different countries in different regions around the world such as Asian countries, European countries, North American countries, Latin American countries and Middle East North Africa countries (Hwang 2012; Kim et al. 2006; Kolluri et al. 2014; Guesmi et al. 2006; Guesmi et al. 2014; Guesmi and Nguyen 2014). Using the sample of stock markets in 81 countries around the world, Pukthuanthong and Roll (2009) found that there are generally upward trends in the stock market global MI. The mean MI for the stock markets included in the pre-1974 cohort year was only 0.19 but it rose to 0.76 by 2007. Members of the European Community and South Korea have experienced the largest increase in global MI. In contrast, several countries have gone toward less integration such as Bangladesh, Nigeria, Pakistan, Sri Lanka, and Zimbabwe.

There is also evidence that the degree of the stock market integration for the developed countries tend to be higher than the emerging countries. Hwang (2012) used the DCC-MGARCH model to find MI across ten Asian-Pacific and US stock markets during the year 2000 to 2010. They found that although the returns from the ten countries are correlated, China's returns appear to be only weakly correlated to the rest. The highest correlation is between Singapore and Hong-Kong (0.75) followed by Australia and New Zealand (0.71) and then Australia and Singapore (0.69). The lowest correlation is between China and the U.S. (0.04), China and Japan (0.16), and China and Korea (0.17). China has very low correlations with all of the markets while the U.S. and Japanese markets have high correlations with the rest of the markets except China, Malaysia, and Taiwan. However, Arouri et al. (2012) found that most emerging markets in their sample experienced a significant increase in MI in the recent period following structural reforms and liberalization.

3.2.3 Determinants of Stock Market Integration

According to the previous literature, the factors affecting MI can be divided into political and economic integration, financial crisis, market anomalies, exchange rate risk, stock market performance, real convergence, monetary policy convergence. Firstly, political and economic integration, financial crisis and market anomalies such as the January effect normally causes the stock market to move in the same direction. Secondly, the exchange rate risk is the exchange rate volatility of each country. Thirdly, stock market performance shows the degree of investment attractiveness in each country including the stock market development, dividend yield and the stock market return volatility. Next, the real convergence is the real economic convergence of each country proxy by the economic growth, trade openness and term structure. Finally, the monetary policy convergence shows the degree of the monetary policy convergence for each country which can be measured by inflation and real short-term interest rate.

Previous studies found that the formation of the political and economic union such as the European Union (EU) lead to a higher degree of MI of the EU countries. Buttner and Hayo (2011) uses the DCC-MGARCH model to find MI among the EU member states during the year 1999-2007 and found that correlations among new EU member states are lower than those Euro area members and the old EU member states outside the euro area suggesting a positive effect of European political integration on MI. Kim et al. (2006) found an increase

in MI between international stock markets and European Economic and Monetary Union (EMU) stock markets in a few years before the introduction of the Euro.

In addition, Dimitrios and Simos (2011) examined the MI for the EMU stock markets during the year 1994 to 2009. They found that there is an increase in MI among EMU stock markets but there is a decrease in MI with the world stock market. Jiang et al. (2017) investigated MI among the ASEAN stock markets during the year 2009 to 2016 and found that the degree of interdependence in ASEAN stock markets is found to be stronger in the short term, especially following particular external shocks such as ASEAN trading link establishment. However, Boubakri and Guillaumin (2011) found that entry into the European Union (EU) in 2004 does not seem to have affected the correlation between CEECs and euro area countries.

For the financial crisis variable (CRISIS), many studies found that the financial crisis plays an important role in increasing stock market integration. Arouri et al. (2012) find the global MI using the sample of 6 emerging markets (Brazil, Chile, Korea, Malaysia, Mexico, Philippines) and 3 developed markets (Canada, France, USA) during the year 1973 to 2008. They found that that there is a substantial increase in market integration after the Asian financial crisis in 1998 except for South Korea, Canada, and the US. In addition, Karim and Karim (2012) found that the ASEAN-5 stock markets are moving towards more integration among themselves, especially following the global financial crisis. Boubakri and Guillaumin (2011) also found that the global crisis started in 2007 had a significant impact on the dynamics of CEEC financial integration with the euro area. For market anomalies variable, Kim et al. (2006) included January effect (JAN) as a dummy variable but they did not find that it is a significant factor that affects the stock market integration.

For the exchange rate risk variable, many studies found that the exchange rate volatility (EXVOL) is a significant factor that affects the stock market integration. Bracker and Koch (1999) found that the exchange rate volatility has a negative and significant effect on the stock market integration across Australia, Canada, Germany, Japan, Switzerland and UK using the daily return data from 1972 to 1993. Guesmi et al. (2006) also found the same result for the Latin America country including Argentina, Brazil, Chile, and Mexico using the monthly data from 1996 to 2008. In addition, Kim et al. (2006) investigated the determinants of the international stock and bond market integration using the daily data from

1994 to 2003 covering the European Monetary Union countries including France, Germany, Italy and other countries including the UK, Japan and the US. They also found that the exchange rate volatility has a negative and significant effect on the stock market integration. Next, Guesmi et al. (2014) found the same result for the Middle East North Africa (MENA) region including Turkey, Israel, Egypt, Jordan, Syria, Kuwait and Tunisia using the monthly return data from 1996 to 2008.

Furthermore, Valdes et al. (2016) examined the determinants of the regional stock market integration for the agribusiness sector using daily data from 1990 to 2005 covering 23 countries including the country in the southern common market, European Union, Asia-Pacific Economic Cooperation and North American Free Trade Agreement. They found that the exchange rate volatility is a negative and significant factor that affects the stock market integration. Arouri et al. (2012) found the same result for the emerging markets Asia, Latin America and two developed markets using the monthly return data from 1973 to 2008.

However, some of the literature found that the exchange rate volatility is not a significant factor that affects the stock market integration. Buttner and Hayo (2011) did not find that the exchange rate volatility is a significant factor that affects the stock market integration among the EU member states using the daily return data from 1999 to 2007. Guesmi and Nguyen (2014) found the same result for the regional integration of the stocks market in Southeast Europe using the monthly return data from 1996 to 2007.

For the stock market performance variable, the first variable commonly used by the previous study is the stock market development (MD) measure by the stock market capitalization per GDP. Many studies found that the stock market development is a positive and significant factor that affects the stock market integration (Guesmi et al. 2006; Buttner and Hayo 2011; Guesmi and Nguyen 2014; Valdes et al. 2016). However, some literature did not find that it is a significant factor (Bracker and Koch 1999; Guesmi et al. 2014; Pretorius 2002).

The second variable is the dividend yield (DY). Many studies found that dividend yield differential is not a significant factor that affects the stock market integration (Guesmi et al. 2006; Guesmi et al. 2014; Guesmi and Nguyen 2014; Valdes et al. 2016). However, Kim et al. (2006) found that the rolling correlation of dividend yield change is a positive and significant factor that affects the stock market integration. Boubakri and Guillaumin (2011)

found that the monthly change in the dividend yield is a negative and significant factor that affects the stock market integration while Arouri et al. (2012) found that the difference between the world and local dividend yield is a positive and significant factor that affects the stock market integration.

The third variable is the stock market volatility (VOL). Bracker and Koch (1999) found that the world market volatility proxy by the standard deviation of daily world stock market index has a positive and significant effect on the stock market integration. Valdes et al. (2016) found that the agricultural stock index volatility is a negative and significant factor that affects the stock market integration. However, Pretorius (2002) did not find that the stock market volatility is a significant factor that affects the stock market integration using the sample of ten emerging stock markets over the period of 1995 until 2000.

For the real convergence variable, the first variable commonly used by the previous study is economic growth (GROWTH). Pretorius (2002) and Kim et al. (2006) found that the rolling correlations in annual growth rates of seasonally adjusted industrial production is a positive and significant factor that affects the stock market integration. However, Bracker and Koch (1999), Guesmi et al. (2006), Guesmi et al. (2014) and (Guesmi and Nguyen 2014) did not find that the difference in industrial production growth rate is a significant variable that explains the stock market integration.

The second variable is the trade openness (TRADE). Pretorius (2002), Guesmi et al. (2006), Kim et al. (2006) and Guesmi and Nguyen (2014) found that the trade openness proxy by the total trade with the world per GDP is a positive and significant factor that affects the stock market integration. However, Valdes et al. (2016) found that the agricultural trade openness proxy by total agricultural trade with the world per nominal GDP has a negative and significant effect on the stock market integration. On the other hand, Bracker and Koch (1999) and (Guesmi et al. 2014) did not find that trade openness is not a significant determinant of the stock market integration.

The third variable is the term structure (TERM). Bracker and Koch (1999) found that the term structure differential has a negative and significant effect on stock market integration. Kim et al. (2006) found that the rolling correlation in term structure change has a positive and significant effect on the stock market integration. In addition, (Guesmi et al. (2014) and

Guesmi and Nguyen (2014) found that the term structure is a positive and significant determinant of the stock market integration.

For the monetary policy convergence variable, the first variable commonly used by the previous study is inflation (IFL). Guesmi et al. (2006) found that the inflation rate is the positive and significant determinant of stock market integration while Guesmi et al. (2014), Guesmi and Nguyen (2014) Valdes et al. (2016) found that the inflation rate has a negative and significant effect on the stock market integration. Moreover, Boubakri and Guillaumin (2011) found the mixed result that for some country the inflation rate differential is negative and significant factor while for other country it is a positive and significant factor for the stock market integration. However, Bracker and Koch (1999), Pretorius (2002) and Mukherjee (2007) did not find that the inflation differential is a significant factor that affects the stock market integration. Furthermore, Kim et al. (2006) found the same result using the rolling correlation in seasonally adjusted CPI as a measure of inflation.

The second variable is the real short-term interest rate (REALRATE). Bracker and Koch (1999) found that the real short-term interest rate differential has a negative and significant effect on the stock market integration. However, Pretorius (2002), Buttner and Hayo (2011) and Boubakri and Guillaumin (2011) did not find that the short-term interest rate differential is an important factor that affects the stock market integration. Kim et al. (2006) found the same result using the rolling correlation in the nominal and real short-term interest rate as a measure of the short-term interest rate.

Table 3.1 summarizes some MI determinants papers and distinguishes papers that found each variable to be a significant or insignificant factor that affect MI.

Table 3.1 Summaries of MI determinants papers

Category	Variables	Significant	Insignificant
Economic and Political Integration	EU	Buttner and Hayo (2011), Kim et al. (2006), Dimitrios and Simos (2011), Jiang et al. (2017)	Boubakri and Guillaumin (2011)
Financial Crisis	CRISIS	Arouri et al. (2012), Karim and Karim (2012), Boubakri and Guillaumin (2011)	-
Market Anomalies	JAN	-	Kim et al. (2006)
Exchange Rate Risk	EXVOL	Bracker and Koch (1999), Guesmi et al. (2006), Kim et al. (2006), Guesmi et al. (2014), Valdes et al. (2016), Arouri et al. (2012)	Buttner and Hayo (2011) Guesmi and Nguyen (2014)
Stock Market Performance	MD	Guesmi et al. (2006), Buttner and Hayo (2011), Guesmi and Nguyen (2014), Valdes et al. (2016)	Bracker and Koch (1999), Guesmi et al. (2014), Pretorius (2002)
	DY	Kim et al. (2006) Boubakri and Guillaumin (2011) Arouri et al. (2012)	Guesmi et al. (2006), Guesmi et al. (2014); Guesmi and Nguyen (2014), Valdes et al. (2016)
	VOL	Bracker and Koch (1999), Valdes et al. (2016)	Pretorius (2002)
Real Convergence	GROWTH	Pretorius (2002), Kim et al. (2006)	Bracker and Koch (1999), Guesmi et al. (2006), Guesmi et al. (2014) and (Guesmi and Nguyen 2014)
	TRADE	Pretorius (2002), Guesmi et al. (2006), Kim et al. (2006) and Guesmi and Nguyen (2014), Valdes et al. (2016)	Bracker and Koch (1999) and (Guesmi et al. 2014)
	TERM	Bracker and Koch (1999), Kim et al. (2006), (Guesmi et al. (2014) and Guesmi and Nguyen (2014)	-
Monetary Policy Convergence	IFL	Guesmi et al. (2006), Guesmi et al. (2014), Guesmi and Nguyen (2014) Valdes et al. (2016), Boubakri and Guillaumin (2011)	Bracker and Koch (1999), Pretorius (2002), Mukherjee (2007), Kim et al. (2006)
	REALRATE	Bracker and Koch (1999)	Pretorius (2002), Buttner and Hayo (2011) and Boubakri and Guillaumin (2011), Kim et al. (2006)

Note: Table 3.1 summarizes some MI determinants papers and distinguishes papers that found each variable to be a significant or insignificant factor that affect MI.

3.2.4 Contributions of This Study

To the best of our knowledge, this study is the first to look at the effect of the stock market consolidation on MI. While other studies have investigated other events such as the formation of the political and economic union on MI as discussed in the previous section, none of the previous literature has examined the effect of the stock market consolidation on MI. The sample period used by this study of 2000-2016 gives the contribution as the result would reveal the recent trend and the driving factors behind MI.

In addition, this empirical work decomposes stages of stock market consolidation into announcement and implement period. None of the previous studies have investigated different stages of the stock market consolidation. Furthermore, including the sample of 20 stock markets around the world gives the contribution as we can see the overview of the effect of consolidation on MI.

3.2.5 Hypothesis Development

From the review of the literature above, the first hypothesis is that the average degree of MI for the developed countries are higher than those of the emerging countries. Secondly, the mean of MI increase after the stock market consolidation with the emerging markets experience a higher increase comparing to developed markets.

Finally, it can be expected that the implementation stage should be associated with the increased level of MI. This is because in this stage physical changes to how the consolidated markets operate and are organized take place. It is less clear whether any MI changes can be observed in the announcement stage. On one hand, one could argue that any changes to the level of MI may not be observed, as the announced consolidation is only declared and not physically implemented, thus, no changes in how individual markets operate and have been organized have taken place. On the other hand, one could argue that given that many market processes have been driven by expectations, increase in MI might be observed following the

announcement.[1] We test whether this is true by testing whether the periods of announcement and of implementation are associated with a significant increase in MI.

For the control variable, financial crisis and market anomalies are expected to have a positive effect on the stock market integration index. The stock market integration between country pairs should increase during the US and EU financial crisis period, and the January effect since the stock markets are affected in the same direction. The hypothesis for the control variable of the country pair difference in exchange rate risk, stock market performance, real convergence and monetary policy convergence is that all these variables are expected to have a negative effect on the stock market integration index. The higher the difference reflects the deviation in the stage of economy making them differ in terms of the attractiveness of equity investment.

[1] Grout and Zalewska (2006) show that just expectations that some policy changes of regulated companies might take place was enough to change the market risk (beta) of these regulated companies.

3.3 Diversification Benefit

Diversification benefit (DB) refers to the benefit that the investors gain when they diversify their investment. When investors include more asset that are not perfectly correlated to each other, they can enjoy the reduce in unsystematic risk without sacrificing the decline in return. Thus, the risk-adjusted return of the portfolio will be increased. This condition is also applied in the international setting where domestic investors can gain higher risk-adjusted return for the portfolio by including the foreign assets that are not perfectly correlated with the domestic one.

From the literature review, we would like to summarize the DB literature from the three main perspectives. Firstly, the DB measure including the pros and cons of the measures. Secondly, the DB empirical works of different countries in different region around the world over time. Finally, the determinants of the DB.

3.3.1 Diversification Benefit Measure

Many studies argue that the correlation between the domestic and foreign markets plays an important role in determining international diversification benefit (Bekaert and Harvey 1995; Grubel 1968; Lessard 1973; Harvey 1995). Levy and Sarnat (1970) argue that the extent to which portfolio diversification decreases portfolio risk depends on the correlations across stock markets. When there is a relatively less degree of positive correlation between each countries' stock market return, it implies that there is the opportunity to reduce portfolio risk through international diversification. The correlation-based diversification benefit uses the correlation between asset return as a measure of the diversification benefit. The correlation and the diversification benefit are expected to move in the opposite direction.

The correlation-based diversification benefit is widely used by previous study (Christoffersen et al. 2014; Kolluri et al. 2014; Miralles-Marcelo et al. 2015). For the dynamic correlation, many studies used the rolling standard correlation (SC) to measure the diversification benefit due to its simplicity. However, rolling SC is subject to the criticism that it depends too much on the rolling window where the short window offers more noise while the long window is more bias. Christoffersen et al. (2014) argued that the DCC-MGARCH is more accurate than the rolling SC as it is adjusted for the heteroskedasticity and it does not depend on the rolling window.

In this study, we will use the correlation-based diversification benefit measure of DCC-MGARCH to investigate the diversification benefit between the US and 18 destination countries around the world that experienced stock market consolidation during the year 2000-2016. We will use SC of 36-month rolling window as a robustness check measure of DB.

3.3.2 Diversification Benefit Empirical Work

Previous literatures have shown in their study that the diversification benefit still exist empirically. Many studies conclude that including the emerging markets securities to the developed markets securities portfolio significantly reduce the unsystematic risk of the portfolio. Bartram and Dufey (2001) claim that even though there is a high volatility in emerging markets securities, the low correlation with developed market returns cause the portfolio risk to reduce without any reduction of the portfolio returns.

From the US investors perspective, many studies find the evidence that US investors can obtain substantial gains from international portfolio diversification through increased risk-sharing by expanding their investment to include the emerging market securities (Huberman and Kandel 1987; Bekaert and Urias 1996; De Roon et al. 2001). On the other hand, investors from emerging markets also benefit from diversifying into developed markets. Driessen and Laeven (2007) find that the international portfolio diversification benefit for emerging countries comes mainly from investing outside the region of the home country.

Empirical evidence by many studies suggest that the correlation between international equity markets are low and there is still the opportunity to gain international diversification benefits (Grubel 1968; Lessard 1973; Harvey 1995). However, in the recent years, many studies found that there has been an increased in correlations between stock markets and therefore the benefits of international diversifications reduced but still exist (Rajan and Friedman 1997; Driessen and Laeven 2007; Miralles-Marcelo et al. 2015).

Christoffersen et al. (2014) explored the patterns and trend in the correlation over time using the weekly returns for 16 developed markets and 13 emerging markets over the period 1973 to 2012. They find that correlations have trended upward significantly for both emerging and developed markets, so the DB have decreased for both markets. However, the level of DB is higher in emerging markets.

3.3.3 Determinants of Diversification Benefit

As we apply the correlation-based diversification benefit measure, the determinant of the DB will be similar to those of MI in the previous chapter but in the opposite direction. Thus, the factors affecting DB can be divided into political and economic integration, financial crisis, market anomalies, exchange rate risk, stock market performance, real convergence, monetary policy convergence summarized in **Table 3.1**.

As we compare the effect of the stock market consolidation on the US diversification benefit toward the consolidation groups that include and exclude US markets, we also need to look the different effect of stock market consolidation on different groups of countries. Dimitrios and Simos (2011) examined the correlation for the EMU stock markets during the year 1994 to 2009. They found that there is an increase in correlation among EMU stock markets but there is a decrease in MI with the world stock market. In addition, Buttner and Hayo (2011) uses the DCC-MGARCH model to find MI among the EU member states during the year 1999-2007 and found that correlations among new EU member states are lower than those Euro area members and the old EU member states outside the euro area.

3.3.4 Contributions of This Study

To the best of our knowledge, this study is the first to look at the effect of the stock market consolidation on DB. A few studies investigated the factors affecting DB but none of them have examined the effect of the stock market consolidation on DB. The sample period used by this study of 2000-2016 gives the contribution as the result would reveal the recent trend and the driving factors behind US DB.

In addition, this empirical work decomposes stages of stock market consolidation into announcement and implement period. None of the previous studies have investigated different stages of the stock market consolidation. This empirical is studied from the US investors perspective because US stock markets take part in two out of six stock market consolidation under our sample time period. The advantage of using the US as a home country will distinguish between the effect of the ease of investing in the country under the same consolidation group and the attractiveness of the destination country after consolidation.

3.3.5 Hypotheses Development

From the review of the literature above, the first hypothesis is that the average degree of the US DB toward the emerging countries should be higher than the developed countries. Secondly, the countries under the same consolidation with the US should have a lower degree of US DB comparing to the countries outside the consolidation group. Thirdly, the mean of US DB after the stock market consolidation with the emerging markets experience a higher decrease comparing to developed markets.

Finally, it can be expected that the implementation stage should be associated with the decreased level of US DB as it is the stage where physical changes to how the consolidated markets operate and are organized take place. It is less clear whether any US DB changes can be observed in the announcement stage. On one hand, one could argue that any changes to the level of US DB may not be observed, as the announced consolidation is only declared and not physically implemented, thus, no changes in how individual markets operate and have been organized have taken place. On the other hand, one could argue that given that many market processes have been driven by expectations, decrease in US DB might be observed following the announcement. We test whether this is true by testing whether the periods of announcement and implementation are associated with a significant decrease in US DB.

For the control variable, financial crisis and market anomalies are expected to have a negative effect on the US DB. The correlation between country pairs should increase during the US and EU financial crisis period, and the January effect since the stock markets are affected in the same direction. The hypothesis for the control variable of the country pair difference in exchange rate risk, stock market performance, real convergence and monetary policy convergence is that all these variables are expected to have a positive effect on US DB. The higher the difference reflects the deviation in the stage of economy making them differ in terms of the attractiveness of equity investment.

3.4 Home Bias

From the literature review, we would like to summarize the home bias literature from the three main perspectives. Firstly, home bias measure including the pros and cons of the measures. Secondly, the home bias empirical works of different countries in different region around the world over time. Finally, the determinants of home bias.

3.4.1 Home Bias Measure

The term home bias (HB) is used to describe the phenomenon where investors bias their investment toward their home or overweight their domestic investment rather than diversifying abroad. Even though there were series of financial liberalization in the last three decades which removed direct and indirect investment restrictions, existing literature shows that investors still deviate from holding internationally diversified portfolio due to the home bias phenomenon (French and Poterba 1991; Cooper and Kaplanis 1994; Bekaert and Harvey 1995; Chan et al. 2005).

There are two different settings that the previous studies used to calculate home bias. Firstly, the home bias from a home country perspective against the rest of the world (Chan et al. 2005; Fidora et al. 2007; Baele et al. 2007a; Anderson et al. 2011). Secondly, the home bias in the bilateral setting which reflects the degree of the home bias from a home country perspective against each destination countries (Dahlquist et al. 2003; Ahearne et al. 2004; Mishra 2014; Daly and Vo 2013; Mishra 2008). In this study, we will apply the home bias in a bilateral setting as we would like to investigate the US HB against each destination countries under the six consolidation groups.

It is generally accepted that HB can be calculated from the formula $HB = 1 - \frac{Actual}{Optimal}$ where actual is the actual weight of foreign securities holdings by domestic investors and optimal is the optimal foreign portfolio weights domestic investors should hold. When the actual and the optimal weights are equal, the home bias value is zero meaning domestic investors diversify their investment abroad according to the optimal portfolio weight, and there is no home bias. When investors hold only domestic asset, the actual weight is zero and the home bias value is one meaning domestic investors do not diversify their investment abroad and invest only in their country. In most case, the actual weight is lower than the optimal weight.

Therefore, the value of home bias lies between zero and one where the degree of home bias is higher when the value is closer to one. For example, if the actual weight is 20% and the optimal weight is 80%, the value of home bias will be 0.75.

International Capital Asset Pricing Model (ICAPM) optimal portfolio weight is widely used by many studies due to its simplicity in term of calculation and interpretation (Baele et al. 2007; Daly and Vo 2013; Dahlquist et al. 2003; Fidora et al. 2007; Chan et al. 2005; Ahearne et al. 2004). As mentioned in the review of the theory part, ICAPM assumes that the optimal weight of domestic investor's foreign securities holding equals to the weight of each country market capitalization in the world market capitalization. However, other studies argue that the ICAPM home bias measure should be adjusted by the number of float share available to trade in each country (Mishra 2008; Mishra 2014; Dahlquist et al. 2003).

In this study, we will use the ICAPM optimal portfolio weight to investigate the US HB toward 22 destination countries around the world that experienced stock market consolidation during the year 2001-2016. We will use float-adjusted ICAPM as a robustness measure of US HB.

3.4.2 Home Bias Empirical Work

French and Poterba (1991) was among the first paper to notice the home bias phenomenon around the world. Since then, many studies started to investigate the evolution of home bias in each region. Many studies argue that there has been a decreasing trend of home bias. Baele et al. (2007) found that home bias decreases sharply at the end of the 1990s for many countries following globalization and regional integration. From a single country perspective, Daly and Vo (2013b) found that the Australian's equity home bias toward most destination countries decreased significantly from 1997 to 2005. However, recent evidence suggests that the degree of home bias is still high in many countries around the world with the value above 0.50 (Baele et al. 2007; Daly and Vo 2013; Mishra 2014).

There is also evidence that the equity home bias of a tends to be lower towards developed countries. Daly and Vo (2013b) discover that Australia's equity HB is lower toward the US and UK when comparing to other countries in the sample. Mishra (2008) found that in 2004, Australia has the highest home bias value of 0.970 toward the Czech Republic while the

lowest value is 0.331 toward The Netherlands. In addition, Ahearne et al. (2004) reveals that US equity home bias varies from 0.98 for China to 0.44 for Ireland and the US home bias towards developed countries tend to be lower than the emerging countries in general.

3.4.3 Determinants of Home Bias

According to the previous literature, the factors that affect home bias can be divided into the category of direct cost, indirect cost, incentive of investment, size, governance. First, the direct cost of investing in the destination country proxy by the withholding tax of dividend in destination countries and the capital account openness index. Second, the indirect cost is the information cost of investing in the destination country proxy by the bilateral trade, internet usage and distance. Third, the incentive of investment reflects the degree of the investment attractiveness of destination countries proxy by exchange rate volatility, diversification benefit, risk-adjusted return, and stock market liquidity. Next, the size variables can be proxy by the market capitalization and GDP growth. The governance variable is proxy by the governance indicator.

For the direct cost, Stulz (1981) and Cooper and Kaplanis (1986) found that the withholding tax (WT) of dividend in the destination country is a significant factor that affects home bias. Mishra (2014) investigated the determinant of Australia's equity home bias using the yearly data from 1999-2009 covering 44 destination countries and found that the destination country's WT has a positive and significant effect on Australia's equity investment home bias. On the other hand, Chan et al. (2005) investigated the determinant of home bias using the mutual fund holding data of 26 host countries to 48 destination countries during the year 1999-2000 and found that the WT is not a significant factors that affect home bias.

The second variable is the capital account openness index (CO). Ahearne et al. (2004) investigated the determinant of US investors' equity investment home bias toward 38 destination countries during the year 1994 and 1997. They found that the CO is a positive and statistically significant factor that affects US investors' home bias. In addition, Daly and Vo (2013) investigated the determinants of Australia's equity investment home bias toward 42 destination countries during the year 2001 to 2005. They found that CO play a statistically significant role in influencing Australian investor's home bias. On the other hand, Chan et al. (2005) concluded that CO is not a significant factor that affects home bias.

For the indirect cost, the first variable is the bilateral trade (BILAT) between home and destination country. While Baele et al. (2007), Mishra (2008) and Mishra (2014) found that trade has a negative and significant effect on home bias, and Fidora et al. (2007) found that trade variable does not statistically affect home bias. The third variable is the usage of internet (INT) as the internet enables investors to gather financial information on equity investment. Mishra (2008) concluded that internet usage of the destination country has a negative and significant effect on Australia's home bias. The fourth variable is the distance between capital to capital (DIST). Portes and Rey (2005) found that the distance between capital and capital has a positive and significant effect on home bias.

For the incentive of investment, the first variable is the exchange rate volatility (EXVOL). Fidora et al. (2007) and Mishra (2014) found that EXVOL has a positive and significant impact on home bias using the sample of both industrialized and emerging market countries. However, Daly and Vo (2013) found that EXVOL volatility has a negative and significant impact on Australia's home bias. The second variable is the diversification benefit (DIVER) proxied by one minus stock market correlation. Many studies found that DIVER has a positive and significant effect on equity home bias (Fidora et al. 2007; Mishra 2014; Mishra 2008b). However, Chan et al. (2005) find that DIVER does not have a significant effect on the equity's home bias. The third variable is the historical risk-adjusted return of the destination countries (RAR). Most of the empirical studies found that the reward-to-risk ratio is not a significant determinant of home bias (Daly and Vo 2013; Ahearne et al. 2004; Mishra 2008). The fourth variable is equity market liquidity (ML) Chan et al. (2005) and Daly and Vo (2013) found that equity market liquidity has a negative and significant effect on equity home bias.

For the size variable, the first variable is the market capitalization of the destination countries (MCAP). Chan et al. (2005), Anderson et al. (2011) and Mishra (2014) found that MCAP has a negative and significant effect on equity investment home bias. However, Dahlquist et al. (2003) and Daly and Vo (2013) found that MCAP is not a significant factor that affects equity home bias. The second variable is the GDP growth of the destination countries (GROWTH). Fidora et al. (2007) and Anderson et al. (2011) found that GROWTH has a negative and significant effect on the equity investment home bias. However, Dahlquist et al. (2003) and Chan et al. (2005) did not find that GROWTH is an important factor that affects the equity investment home bias.

For the governance variable, Chan et al. (2005), Fidora et al. (2007) and Daly and Vo (2013) found that governance indicator (GOV) of the destination country has a negative and significant effect on equity investment home bias. However, Dahlquist et al. (2003) did not find that governance is an important factor that affects the equity investment home bias.

Table 3.2 summarizes some HB determinants papers and distinguishes papers that found each variable to be a significant or insignificant factor that affect HB.

Table 3.2 Summaries of HB determinants papers

Category	Variables	Significant	Insignificant
Direct cost	WT	Stulz (1981), Cooper and Kaplanis (1986), Mishra (2014)	Chan et al. (2005)
	CO	Ahearne et al. (2004), Daly and Vo (2013)	Chan et al. (2005)
Indirect cost	BILAT	Baele et al. (2007), Mishra (2008), Mishra (2014)	Fidora et al. (2007)
	INT	Mishra (2008)	-
	DIST	Portes and Rey (2005)	-
Incentive of investment	EXVOL	Fidora et al. (2007), Mishra (2014), Daly and Vo (2013)	-
	DIVER	Fidora et al. (2007), Mishra (2014) Mishra (2008)	Chan et al. (2005)
	RAR	-	Daly and Vo (2013), Ahearne et al. (2004), Mishra (2008)
	ML	Chan et al. (2005) and Daly and Vo (2013)	-
Size	MCAP	Chan et al. (2005), Anderson et al. (2011) and Mishra (2014)	Dahlquist et al. (2003) and Daly and Vo (2013)
	GROWTH	Fidora et al. (2007) and Anderson et al. (2011)	Dahlquist et al. (2003) and Chan et al. (2005)
Governance	GOV	Chan et al. (2005), Fidora et al. (2007) and Daly and Vo (2013)	Dahlquist et al. (2003)

Note: Table 3.2 summarizes some HB determinants papers and distinguishes papers that found each variable to be a significant or insignificant factor that affect HB.

3.4.4 Contributions of This Study

To the best of our knowledge, this study is the first to look at the effect of the stock market consolidation on HB. Many studies investigated the factors affecting HB but none of them have examined the effect of the stock market consolidation on HB. The sample period used by this study of 2001-2016 gives the contribution as the result would reveal the recent trend and the driving factors behind US HB.

In addition, this empirical work decomposes stages of stock market consolidation into announcement and implement period. None of the previous studies have investigated different stages of the stock market consolidation. Finally, the advantage of using the US as a home country will distinguish between the effect of the ease of investing in the country under the same consolidation group and the attractiveness of the destination country after consolidation.

3.4.5 Hypothesis Development

From the review of the literature above, the first hypothesis is that the average degree of the US HB toward the emerging countries should be higher than the developed countries. Secondly, the countries under the same consolidation with the US should have a lower degree of US HB comparing to the countries outside the consolidation group. Thirdly, the mean of US HB after the stock market consolidation with the emerging markets experience a higher decrease comparing to developed markets.

Finally, it can be expected that the implementation stage should be associated with the decreased level of US HB as it is the stage where physical changes to how the consolidated markets operate and are organized take place. It is less clear whether any US HB changes can be observed in the announcement stage. On one hand, one could argue that any changes to the level of US HB may not be observed, as the announced consolidation is only declared and not physically implemented, thus, no changes in how individual markets operate and have been organized have taken place. On the other hand, one could argue that given that many market processes have been driven by expectations, decrease in US HB might be observed following the announcement. We test whether this is true by testing whether the periods of announcement and implementation are associated with a significant decrease in US HB.

The hypothesis for the control variable of the destination country's direct cost, indirect cost, incentive of investment, size, and governance are expected to have a different effect on US HB. The details of the expected sign for each control variable will be discussed in Chapter 6.

Chapter 4: Stock Market Consolidation and Stock Market Integration

4.1 Introduction and literature review

In consolidated markets, capital flows freely to the place that generates the highest return. Market participants would have easier access to foreign capital but are more vulnerable to financial crises that occur in the other part of the world. The stock market consolidation plan is believed to increase the degree of MI which will eventually decrease the diversification benefit.

The objectives of this chapter are to compare MI between six stock market consolidation groups, compare mean MI in different stages and examine the factors affecting MI especially the effect of different stages of the stock market consolidation on MI controlling for numerous economic and stock market characteristics.

In this study, we use DCC-MGARCH between the stock market index return to measure the MI index because we would like to investigate the degree of bilateral stock market integration in a dynamic process. We will also use SC as a robust measure of MI. The scope of this empirical essay is to investigate MI using the sample of 20 stock markets in 19 countries around the world that experienced the stock market consolidation during the year 2000-2016.

Many studies have examined the development of MI over time (Hwang 2012; Kolluri et al. 2014; Pukthuanthong and Roll 2009; Bit-kun et al. 2015; Dimitriou and Simos 2013). Other studies investigated the factors that impact MI (Bracker and Koch 1999; Guesmi et al. 2006; Kim et al. 2006; Guesmi et al. 2014; Valdes et al. 2016; Arouri et al. 2012). However, none of the previous studies examined the effect of the stock market consolidation on MI.

Previous literatures used different methods to measure the degree of MI. Early literature used Johansen's cointegration and Granger causality test to find the degree of MI among the group of countries in a specific period (Arshanapalli et al. 1995; Click and Plummer 2005; Lim 2009; Azali et al. 2010). However, this approach has been criticized for being a static approach that cannot capture the dynamic of MI (Kearney and Lucey 2004; Kim et al. 2006). Later on, many studies started to apply the dynamic measure of MI to track the development

of MI over time such as rolling standard correlation (SC) and heteroskedasticity-adjusted correlation-based measures.

Since there is an ongoing debate whether SC is a robust measure of integration, heteroskedasticity-adjusted correlation-based measures such as the dynamic conditional correlation Multivariate Generalized Autoregressive Conditional Heteroskedasticity model (DCC-MGARCH) proposed by Engle and Robert (2002) are widely used. The advantage of using the heteroskedasticity-adjusted correlation-based measures is that it can produce a numeric measure and can capture the dynamic process of the correlation in a bilateral setting.

The rest of the chapter is organized as followed: 4.2 gives the data and variables including sample, variable description, expected sign and hypothesis and descriptive statistics. 4.3 shows the methodology including the conceptual and empirical model. 4.4 provides the result following the objectives of the study. 4.5 discusses the result and 4.6 concludes the key takeaway from the chapter.

4.2 Data and Variables

4.2.1 Sample

Our sample covers the 2000-2016 period so that we have the data for the pre-and the post-consolidation years for the six stock market consolidations. We use monthly data to avoid daily and weekly market anomalies. We derive the number of stock market pairs under each consolidation group from the combination formula $C(n, r) = \frac{n!}{(n-r)!r!}$ where n represents the total number of stock markets under each group and r is the number of stock market chosen at a time which in this case is two as we want to see the combination of stock market pairs where the orders are not important. **Table 4.1** shows the number of stock markets and the number of stock market pairs for each stock markets consolidation group and the total number.

Table 4.1 Number of stock market pairs

Consolidation group	Number of stock markets	Number of Pairs
NYSE-EURONEXT	5	10
NASDAQ- OMX	4	6
LSE-BI	2	1
CEESEG	3	3
MILA	3	3
ATL	3	3
Total	**20**	**26**

Note: Table 4.1 shows the number of stock markets and the number of stock market pairs for each stock markets consolidation group and the total number.

We derive the sample using the step shown in **Table 4.2**. Starting with 8,364 observation from the chosen countries and sample period, we lose 612 observation from missing data from MSCI database. Furthermore, we lose 2,448 observations where the data are missing for the control variable. The final sample consists of 5,304 country-month observations.

Table 4.2 Sample Selection

Sample Selection 2000-2016	
	Observations
Chosen countries and sample period	8,364
Less: Observation with missing data from MSCI database	(612)
Less: Observation with missing data for the control variables	(2,448)
Final Sample	5,304

Note: We derive the sample using the step shown in Table 4.2.

The final sample is the New York Stock Exchange-Euronext (NYSE-EURONEXT) including Amsterdam Stock Exchange (Netherland), Brussels Stock Exchange (Belgium), Paris Stock Exchange (France), Lisbon Stock Exchange (Portugal) and NYSE (USA). NASDAQ-OMX includes Stockholm Stock Exchange (Sweden), Helsinki Stock Exchange (Finland), Copenhagen, Stock Exchange (Denmark) and NASDAQ (USA). London Stock Exchange-Italian Stock Exchange (LSE-BI) includes the London Stock Exchange (UK), Italian Stock Exchange (Italy). Central and Eastern Europe Stock Exchange Group (CEESEG) includes the Budapest Stock Exchange (Hungary), Prague Stock Exchange

(Czech Republic) and Vienna Stock Exchange (Austria). Latin America Integrated Market (MILA) includes the Lima Stock Exchange (Peru), Colombia Stock Exchange (Colombia) and Mexican Stock Exchange (Mexico). ASEAN Trading Link (ATL) includes Bursa Malaysia (Malaysia), Singapore Exchange (Singapore), Stock Exchange of Thailand (Thailand). **Table 4.3** summarizes the sample stock market index under each stock market consolidation group as well as the announcement and implement date of the consolidation.

Table 4.3 Sample Stock Market Consolidation and announcement and implement Date

Consolidation Group	Stock Market Index	Announcement	Implement
NYSE-EURONEXT	Amsterdam Stock Exchange (Netherland)	September 2000	November 2003
	Brussels Stock Exchange (Belgium)	September 2000	November 2003
	Paris Stock Exchange (France)	September 2000	November 2003
	Lisbon Stock Exchange (Portugal)	February 2002	November 2003
	NYSE (USA)	June 2006	April 2007
NASDAQ- OMX	Stockholm Stock Exchange (Sweden)	May 2003	September 2004
	Helsinki Stock Exchange (Finland)	May 2003	September 2004
	Copenhagen Stock Exchange (Denmark)	November 2004	February 2005
	NASDAQ (USA)	May 2007	February 2008
LSE-BI	London Stock Exchange (UK)	June 2007	October 2007
	Italian Stock Exchange (Italy)	June 2007	October 2007
CEESEG	Budapest Stock Exchange (Hungary)	November 2008	January 2010
	Prague Stock Exchange (Czech Republic)	November 2008	January 2010
	Vienna Stock Exchange (Austria)	November 2008	January 2010
MILA	Lima Stock Exchange (Peru)	September 2009	May 2011
	Colombia Stock Exchange (Colombia)	September 2009	May 2011
	Mexican Stock Exchange (Mexico)	July 2014	December 2014
ATL	Bursa Malaysia (Malaysia)	April 2011	September 2012
	Singapore Exchange (Singapore)	April 2011	September 2012
	Stock Exchange of Thailand (Thailand)	April 2011	October 2012

Note: Table 4.3 summarizes the sample stock market index under each stock market consolidation group as well as the announcement and implement date of the consolidation.

4.2.2 Variable Description

The dependent variable of stock market integration (MI) is calculated from DCC between country pair under each stock market consolidation project. The data of the price indices of each stock market were obtained from the Morgan Stanley Capital International (MSCI) via Datastream. For the dummy consolidation variables which are the variables of interest in this study, we included the dummy for the stock market consolidation announcement period (ANNOUNCE) which equals to 1 from the announcement date to the implement date and 0 otherwise and the dummy for stock market consolidation implement period (IMPLEMENT) which equals to 1 from the implement date until the end of the sample and 0 otherwise to distinguish between the effect from the announcement of the deal and the implementation of the deal. This data is obtained from the stock market consolidation's official website.

We included the dummy control variable for the global financial crisis started in the US (CRISISUS) which equals to 1 during the period August 2007 to February 2009 and 0 otherwise and the dummy for the European debt crisis (CRISISEU) which equals to 1 during the period December 2009 to July 2011 and 0 otherwise. The crisis period data are obtained from the International Monetary Fund (IMF)'s World Economic Outlook (WEO) crisis and recovery report.

We also include the January effect (JAN) which equals to 1 in January and 0 otherwise to control for the seasonal market anomaly (Kim et al. 2006). Stock market anomalies happen when securities in the market don't follow efficient market hypothesis where price should reflect all available information at any point in time. The most famous stock market anomaly is calendar effect such as weekend effect and January effect. We control for January effect in this study as we look at the monthly data not the weekly data. January effect shows that the stock market price index usually increases in January more than the other months of the year.

We also control for the exchange rate risk (EXVOL) calculated from conditional volatility generated from an AR (1) process with GARCH (1,1) errors on ln $(REER_t/REER_{t-1})$ where REER is the real effective exchange rate. The dynamic standard deviation is then calculated from the square root of this volatility. The other variables are the stock market performance variables including stock market development (MD) proxy by monthly percentage change in market capitalization per Gross Domestic Product (GDP), dividend yield (DY) calculated from dividend per price and the stock market return volatility (VOL) calculated from conditional volatility generated from an AR (1) process with GARCH (1,1) errors on stock market return. The return is calculated from the ln $(PriceIndex_t/PriceIndex_{t-1})$ where the price index is expressed in terms of local currency. The dynamic standard deviation is then calculated from the square root of this volatility.

In addition, real convergence variable includes the economic growth (GROWTH) proxy by ln (IP_t/IP_{t-1}) where IP is seasonally adjusted industrial production index, trade openness (TRADE) proxy by monthly percentage change in total trade with the world per GDP and the term structure of interest rate (TERM) calculated from the difference between long-term interest rate and short-term interest rate where long-term and short-term interest rate are proxy by ten-year government bond and one-month interbank rate respectively.

The monetary policy convergence variable includes inflation (IFL) proxy by ln (CPI_t/CPI_{t-1}) where CPI is seasonally adjusted consumer price index and the real interest rate (REALRATE) calculated from the difference between the short-term nominal interest rate and inflation where short term nominal interest rate is proxy by one-month interbank rate. All above-mentioned control variables are in the form of absolute difference between the

country pairs and the data is obtained from Datastream. All the variable definitions are summarized in **Table 4.4**.

Table 4.4 Variable Definitions

Category	Variables	Definition
Dependent Variable	MI	Stock market integration index calculated from DCC between country pair under each stock market consolidation project. The value is normalized to 1
Dummy Consolidations	ANNOUNCE	Stock market consolidation announcement period (= 1 from the announcement date to the implement date and 0 otherwise)
	IMPLEMENT	Stock market consolidation implement period (= 1 from the implement date onward and 0 otherwise)
Financial Crisis	CRISISUS	US global financial crisis (= 1 during the period August 2007 to February 2009 and 0 otherwise)
	CRISISEU	European debt crisis (= 1 during the period December 2009 to July 2011 and 0 otherwise)
Market Anomalies	JAN	January Effect (= 1 in January and 0 otherwise)
Exchange Rate Risk	EXVOL	Exchange Rate Volatility calculated from conditional volatility generated from an AR (1) process with GARCH (1,1) errors on ln $(ExRate_t/ExRate_{t-1})$. Exchange rate is expressed in terms of REER. The dynamic standard deviation is then calculated from square root of this volatility.
Stock Market Performance	MD	Stock Market Development proxy by monthly percentage change in market capitalization/GDP
	DY	Dividend Yield (dividend/price)
	VOL	Stock market return volatility calculated from conditional volatility generated from an AR (1) process with GARCH (1,1) errors on stock market return. The return is calculated from the ln $(PriceIndex_t/PriceIndex_{t-1})$ where the price index is expressed in terms of local currency. The dynamic standard deviation is then calculated from square root of this volatility.
Real Convergence	GROWTH	Economic Growth proxy by ln (IP_t/IP_{t-1}) where IP is seasonally adjusted industrial production index
	TRADE	Trade Openness proxy by monthly percentage change in total trade with the world/GDP
	TERM	Term structure of Interest Rate (Long-term interest rate - Short-term interest rate) long-term and short-term interest rate proxy by ten-year government bond and one-month interbank rate respectively
Monetary Policy Convergence	IFL	Inflation rate proxy by ln (CPI_t/CPI_{t-1}) where CPI is seasonally adjusted consumer price index
	REALRATE	Real Short-Term Interest Rate calculated from short-term nominal interest rate – inflation where short term nominal interest rate is proxy by one-month interbank rate

Note: All the variable definitions are summarized in **Table 4.4**.

4.2.3 Expected Sign and Hypothesis

For the dependent variable, the hypothesis is that the mean of the MI for the developed countries should be higher than the emerging countries. We also expect mean MI to increase after the stock market consolidation ANNOUNCE and IMPLEMEN comparing to the pre-announce period with emerging countries having higher increase in MI compared to developed countries as discussed in the literature review part. When analyzing the factors affecting MI, the stock market consolidation ANNOUNCE and IMPLEMENT variable are expected to have a positive effect on MI.

We expect that MI should increase during the CRISISUS, CRISISEU and JAN since the stock markets are affected in the same direction (Bekaert et al. 2011; Carrieri et al. 2013). We predict that the control variable of the absolute difference in exchange rate risk, stock market performance, real convergence and monetary policy convergence should have a negative effect on MI index as the higher the difference reflects the deviation in the stage of economy and the correlation between the two stock markets return should decline. However, there is also a possibility that these variables might have a positive effect on MI index if the investors see that the difference in the stage of the economy reflect the diversification opportunity and invest in both countries to gain diversification benefit.

Table 4.5 summarizes the expected sign for each independent variable.

Table 4.5 Expected sign

Independent Variables	Expected Sign
ANNOUNCE	+
IMPLEMENT	+
CRISISUS	+
CRISISEU	+
JAN	+
EXVOL	-
MD	-
DY	-
VOL	-
GROWTH	-
TRADE	-
TERM	-
IFL	-
REALRATE	-

Note: Table 4.5 summarizes the expected sign for each independent variable.

4.2.4 Descriptive Statistics

Descriptive statistics including the mean, standard deviation, minimum, maximum, skewness, kurtosis and the augmented Dicky-Fuller (ADF) unit root test for stationarity for the dependent and independent variables can be found in **Table 4.6**. The skewness range that the data would consider to be normal is between -2 and +2. MI, EXVOL, DY and TRADE variable is in the normal range while the MD, VOL, GROWTH, TERM, IFL, REALRATE, shows a sign of a little bit right-skewed. For the normal distribution, the kurtosis value should be equal to 3. MI have the kurtosis value that is very close to 3 while the other variable shows to some extent the degree of leptokurtic or fat tails. The ADF test result shows that all of the variable rejects the null hypothesis and the variables are

stationary. The skewness, kurtosis and unit root test are not conducted for the dummy variable.

Table 4.6 Descriptive Statistics

Variables	Mean	SD	Min	Max	Skewness	Kurtosis	ADF
MI	0.663	0.160	0	1	-0.549	3.509	-4.479***
ANNOUNCE	0.074	0.263	0	1	-	-	-
IMPLEMENT	0.529	0.499	0	1	-	-	-
CRISISUS	0.093	0.291	0	1	-	-	-
CRISISEU	0.098	0.297	0	1	-	-	-
JAN	0.083	0.276	0	1	-	-	-
EXVOL	0.005	0.006	0	0.052	1.998	9.421	-4.608***
MD	0.255	0.359	0	5.771	5.849	61.714	-9.110***
DY	0.012	0.012	0	0.099	1.920	7.417	-2.962***
VOL	0.016	0.015	0	0.140	2.371	11.697	-4.014***
GROWTH	0.027	0.027	0	0.302	2.910	17.552	-8.961***
TRADE	0.060	0.062	0	0.472	1.978	7.862	-9.372***
TERM	0.011	0.015	0	0.165	3.461	19.643	-3.312***
IFL	0.002	0.002	0	0.027	2.776	18.634	-9.545***
REALRATE	0.012	0.016	0	0.148	2.483	10.741	-4.814***

Note: Descriptive statistics including the mean, standard deviation, minimum, maximum, skewness, kurtosis and the augmented Dicky-Fuller (ADF) unit root test for stationarity for the dependent and independent variables can be found in Table 4.6.

A pairwise correlation matrix is reported in **Table 4.7,** where correlation significant at the 5% level or better are highlighted in bold. Consistent with the hypothesis, we find that ANNOUNCE and IMPLEMENT are significantly and positively correlated with MI. Furthermore, none of the correlation exceeds 0.5 and according to **Table 4.8**, we find that the average value of Variance-Inflation-Factors (VIFs) is 1.23 and none of the VIFs exceeds 10.0, indicating that the multicollinearity is not an issue in our regressions.

Table 4.7 Pairwise Correlation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) MI	1														
(2) ANNOUNCE	**0.12**	1													
(3) IMPLEMENT	**0.33**	**-0.30**	1												
(4) CRISISUS	**0.06**	-0.01	**0.05**	1											
(5) CRISISEU	**0.07**	-0.02	**0.15**	**-0.11**	1										
(6) JAN	0.01	-0.01	-0.01	0.02	0.02	1									
(7) EXVOL	**-0.46**	**-0.08**	**-0.17**	**0.08**	-0.02	-0.01	1								
(8) MD	0.01	-0.01	**-0.09**	**0.04**	**-0.03**	**0.09**	**-0.03**	1							
(9) DY	**-0.12**	**-0.10**	**0.20**	**0.04**	**0.06**	0.01	**0.12**	**-0.12**	1						
(10) VOL	**-0.27**	-0.01	**-0.28**	0.02	**-0.06**	0.02	**0.23**	**0.18**	**0.03**	1					
(11) GROWTH	**-0.08**	-0.01	**-0.03**	**0.06**	0.01	**-0.03**	0.01	**0.04**	**-0.05**	**0.03**	1				
(12) TRADE	**0.03**	**0.05**	0.02	0.01	**0.04**	0.01	**-0.08**	-0.02	-0.02	**-0.03**	**0.05**	1			
(13) TERM	**-0.21**	**-0.09**	**-0.07**	**-0.05**	-0.01	0.01	**0.03**	**-0.07**	**0.26**	0.01	**-0.02**	**-0.07**	1		
(14) IFL	**-0.11**	-0.01	**-0.14**	**0.09**	**-0.04**	**-0.04**	**0.10**	-0.01	**0.04**	**0.04**	**0.05**	**0.04**	**0.09**	1	
(15) REALRATE	**-0.22**	0.01	**-0.33**	**0.03**	**-0.04**	0.01	**0.28**	**-0.09**	**0.11**	**0.08**	-0.01	**0.05**	**0.34**	**0.21**	1

Note: A pairwise correlation matrix is reported in Table 4.7, where correlation significant at the 5% level or better are highlighted in bold.

Table 4.8 Variance-Inflation-Factors (VIFs)

Variables	VIFs
MI	1.60
ANNOUNCE	1.20
IMPLEMENT	1.67
CRISISUS	1.06
CRISISEU	1.05
JAN	1.01
EXVOL	1.44
MD	1.08
DY	1.21
VOL	1.20
GROWTH	1.03
TRADE	1.04
TERM	1.30
IFL	1.08
REALRATE	1.44
Mean VIFs	1.23

Note: according to Table 4.8, we find that the average value of Variance-Inflation-Factors (VIFs) is 1.23 and none of the VIFs exceeds 10.0, indicating that the multicollinearity is not an issue in our regressions

4.3 Methodology

4.3.1 Conceptual Model

To measure the degree of the stock market integration (MI), Dynamic Conditional Correlation-Multivariate Generalized Autoregressive Conditional Heteroscedasticity (DCC-MGARCH) model is used to calculate the dynamic conditional correlation of stock market returns in a bilateral setting. The DCC-MGARCH model aims to capture the dynamic conditional correlation between stock markets returns instead of a static correlation in a specific period of time. The DCC-MGARCH model proposed by Engle and Robert (2002) has representation shows in equation **(4.1), (4.2)** and **(4.3)**

$$\boldsymbol{H_t = D_t R_t D_t} \quad \textbf{(4.1)}$$

$$\boldsymbol{D_t = diag\left(\sqrt{h_{11,t}}, \sqrt{h_{22,t}}, \ldots, \sqrt{h_{NN,t}}\right)} \quad \textbf{(4.2)}$$

$$\boldsymbol{R_t = diag\,(Q_t)^{-\frac{1}{2}}\, Q_t (diag Q_t)^{-\frac{1}{2}}} \quad \textbf{(4.3)}$$

where D_t is the diagonal matrix of conditional standard deviations, R_t the matrix representing the structure of correlations between variables and h is the conditional variances based on a fractionally integrated GARCH model proposed by Baillie et al. (1996). Q_t is a matrix of dimension (N, N), symmetrical and positive given by equation **(4.4)**

$$\boldsymbol{Q_t = (1 - \theta_1 - \theta_2)\overline{Q} + \theta_1 u_{t-1} u'_{t-1} + \theta_2 Q_{t-1}} \quad \textbf{(4.4)}$$

and $u_t = (u_{1,t}, u_{2,t}, \ldots, u_{N,t})'$ is a column vector of the standardized residuals for the N assets in the portfolio at time t. $u_{it} = \frac{\varepsilon_{i,t}}{\sqrt{h_{ii,t}}}$ with i =1,…, N. Coefficients θ_1 and θ_2 are the parameters to be estimated. The sum of these coefficients must be less than 1 to satisfy the positivity of matrix Q_t. The estimation of multivariate model parameters is based on the maximum likelihood method. Assuming that the residuals are Gaussian, the likelihood function is written as equation **(4.5)**

$$\boldsymbol{L_T(\theta) = -\frac{1}{2}\sum_{t=1}^{T}\left(log|D_t R_t D_t| - u'_t R_t^{-1} u_t\right)} \quad \textbf{(4.5)}$$

where $u_t = D_t^{-1}(y_t - u_t)$ and $u'_t R_t^{-1} u_t = (y_t - u_t)' D_t^{-1} R_t^{-1} D_t^{-1} (y_t - u_t)$. The process of estimating the DCC model involves two stages. Firstly, the conditional variance of each variable of the system is estimated. Secondly, the standardized residuals of the first-stage regressions are used to model the correlations in an autoregressive way and thus supplies the conditional correlation matrix which varies over time. MI is measured by the dynamic conditional correlations between stock market returns calculated from equation **(4.6)**

$$\boldsymbol{MI_{ij,t} = \rho_{ij,t} = \frac{q_{ij,t}}{\sqrt{q_{i,t} q_{j,t}}}} \quad \textbf{(4.6)}$$

with i,j=1,2 and $q_{ij,t}$ as elements of Q_t. The return for each country stock index is calculated from the formula $R_t = ln\ P_t - ln\ P_{t-1}$ Where R_t is the return of the stock market index at time t, $ln\ P_t$ is the natural log of the stock market price index at time t and $ln\ P_{t-1}$ is the natural log of the stock market price index at time t – 1 where the price index is expressed in terms of local currency. From equation **(4.6)**, note that MI is normalized to 1 with 1 meaning the stock markets are fully integrated while 0 meaning the stock market are not integrated.

We will use the standard correlation (SC) with 36 months rolling window as a robustness check measure of MI. SC is calculated from the Pearson correlation coefficient formula shown in equation **(4.7)**

$$\boldsymbol{\rho_{xy}} = \frac{\boldsymbol{Cov}\,(\boldsymbol{r_x}, \boldsymbol{r_y})}{\boldsymbol{\sigma_x \sigma_y}} \qquad \textbf{(4.7)}$$

where r_x is the return for stock market x, r_y is the return for the stock market y, σ_x is the variance for stock market x and σ_y is the variance of the stock market y. We then use the rolling method with 36 months window to see the dynamic of SC. 36 months is chosen instead of a shorter period to decrease the noise of the data. SC is normalized to 1 with 1 meaning the stock markets are fully integrated while 0 meaning the stock market are not integrated.

4.3.2 Empirical Model

To investigate the stock market consolidations effect on MI, we employed a fixed effect OLS panel regression to estimate equation **(4.8)**. We use fixed effect because the Hausman test suggests that the fixed effect is preferred to the random effect model (**Table B-2** and **Table B-3** in **Appendix B**). Independent variable of different stages of stock market consolidation ANNOUNCE and IMPLEMENT are included. We also include the control variable of the US global financial crisis, Euro debt crisis, January effect exchange rate risk, incentive of investment, real convergence and monetary policy convergence.

$$\begin{aligned}\mathbf{MI}_{i,t} = {} & \boldsymbol{\alpha_{i,t}} + \boldsymbol{\beta_1 ANNOUNCE_{i,t}} + \boldsymbol{\beta_2 IMPLEMENT_{i,t}} + \boldsymbol{\beta_3 CRISISUS_{i,t}} + \\ & \boldsymbol{\beta_4 CRISISEU_{i,t}} + \boldsymbol{\beta_5 JAN_{i,t}} + \boldsymbol{\beta_6 EXVOL_{i,t-1}} + \boldsymbol{\beta_7 MD_{i,t-1}} + \boldsymbol{\beta_8 DY_{i,t-1}} + \\ & \boldsymbol{\beta_9 VOL_{i,t-1}} + \boldsymbol{\beta_{10} GROWTH_{i,t-1}} + \boldsymbol{\beta_{11} TRADE_{i,t-1}} + \boldsymbol{\beta_{12} TERM_{i,t-1}} + \boldsymbol{\beta_{13} IFL_{i,t-1}} + \\ & \boldsymbol{\beta_{14} REALRATE_{i,t-1}} + \boldsymbol{\varepsilon_{i,t}}\end{aligned} \qquad \textbf{(4.8)}$$

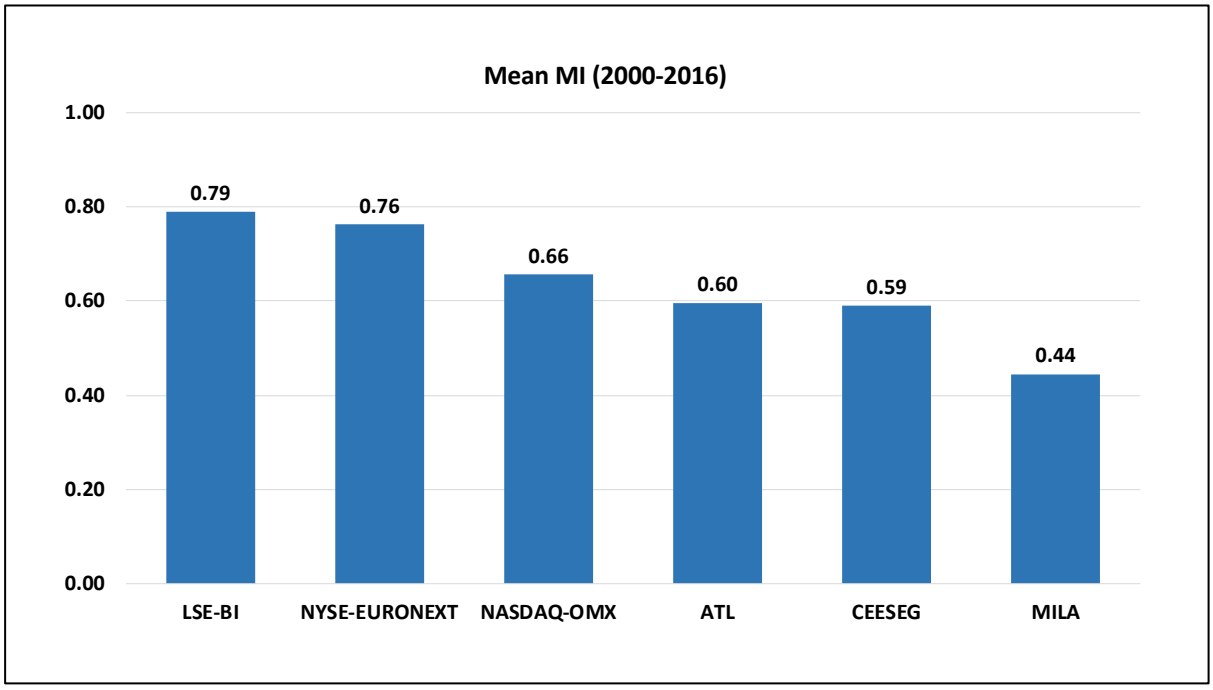
To make sure that the result is robust, we will report Newey-West robust standard error in the result to avoid potential issue arising from heteroscedasticity and autocorrelation. To check for omitted variable bias issue, we apply the Ramsey reset test and found that there is no omitted variable bias in the model (**Table B-1** in **Appendix B**). We also solved for the reverse causality problem by including the lagged independent variable as shown in equation **(4.8)**. The result is clustered by the consolidation group to make sure that the result is not affected by the common characteristics within each group. To take into account for the outlier, all the variables are winsorized at a 95% confidence interval.

4.4 Result

4.4.1 Comparison of MI

To see the overview of MI, we compare the mean of MI calculated from the DCC-MGARCH model for six stock market consolidation groups in our sample during the year 2000-2016. According to **Figure 4.1,** the consolidation group that has the highest mean MI is LSE-BI (0.79) followed by NYSE-EURONEXT (0.76), NASDAQ-OMX (0.66), ATL (0.60), CEESEG (0.59), and the country with the lowest mean MI is MILA (0.44). We observe low mean MI for emerging markets consolidation (ATL, CEESEG and MILA) as emerging markets usually have higher investment barriers comparing to those of developed markets.

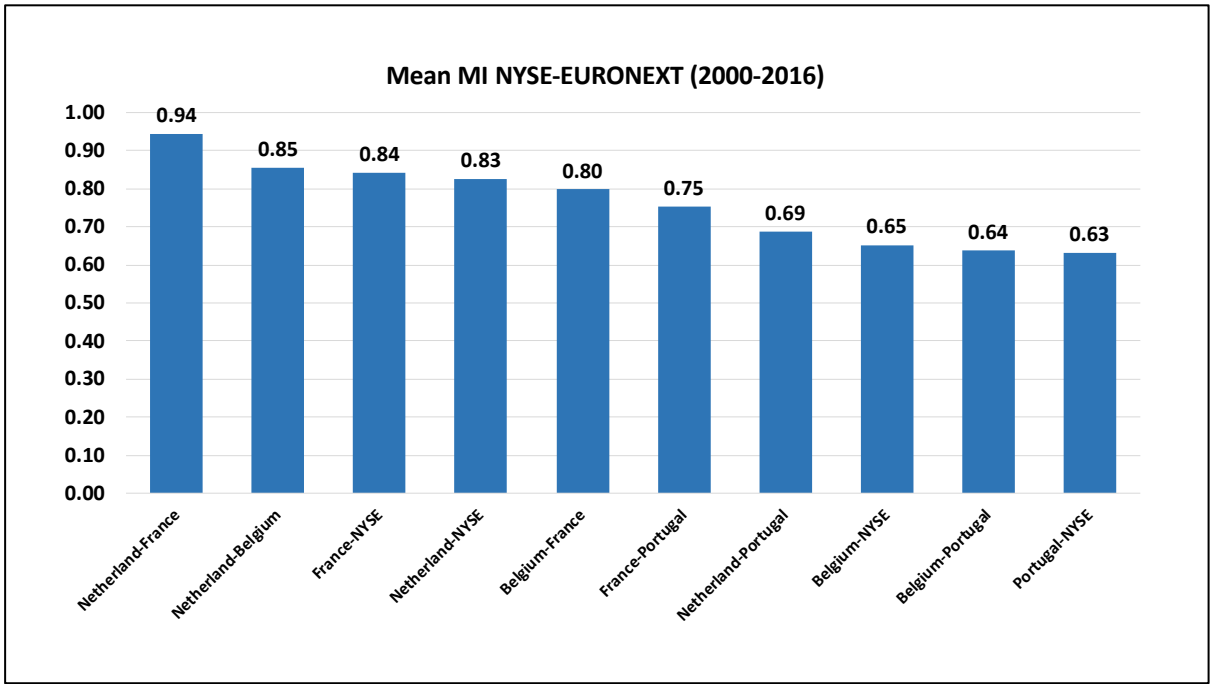
Figure 4.1 Mean MI for six stock market consolidation groups (2000-2016)



Note: According to Figure 4.1, the consolidation group that has the highest mean MI is LSE-BI (0.79) followed by NYSE-EURONEXT (0.76), NASDAQ-OMX (0.66), ATL (0.60), CEESEG (0.59), and the country with the lowest mean MI is MILA (0.44). We observe low mean MI for emerging markets consolidation (ATL, CEESEG and MILA) as emerging markets usually have higher investment barriers comparing to those of developed markets.

To look at MI for each stock market consolidation groups in detail, we compare the mean MI for the stock market pair within each group. For LSE-BI, there is only one country pair in this group so we will start the figure with the comparison of NYSE-EURONEXT group. **Figure 4.2** shows the mean MI of stock market pair under NYSE-EURONEXT during the year 2000-2016. The stock market pair that has the highest mean MI is Netherland-France (0.94), followed by Netherland-Belgium (0.85), NYSE-France (0.84), NYSE-Netherland (0.83), France-Belgium (0.80), Portugal-France (0.75), Portugal-Netherland (0.69), NYSE-Belgium (0.65), Portugal-Belgium (0.64) and the stock market pair with lowest mean MI is NYSE-Portugal (0.63).

Figure 4.2 Mean MI for NYSE-EURONEXT stock market pair (2000-2016)



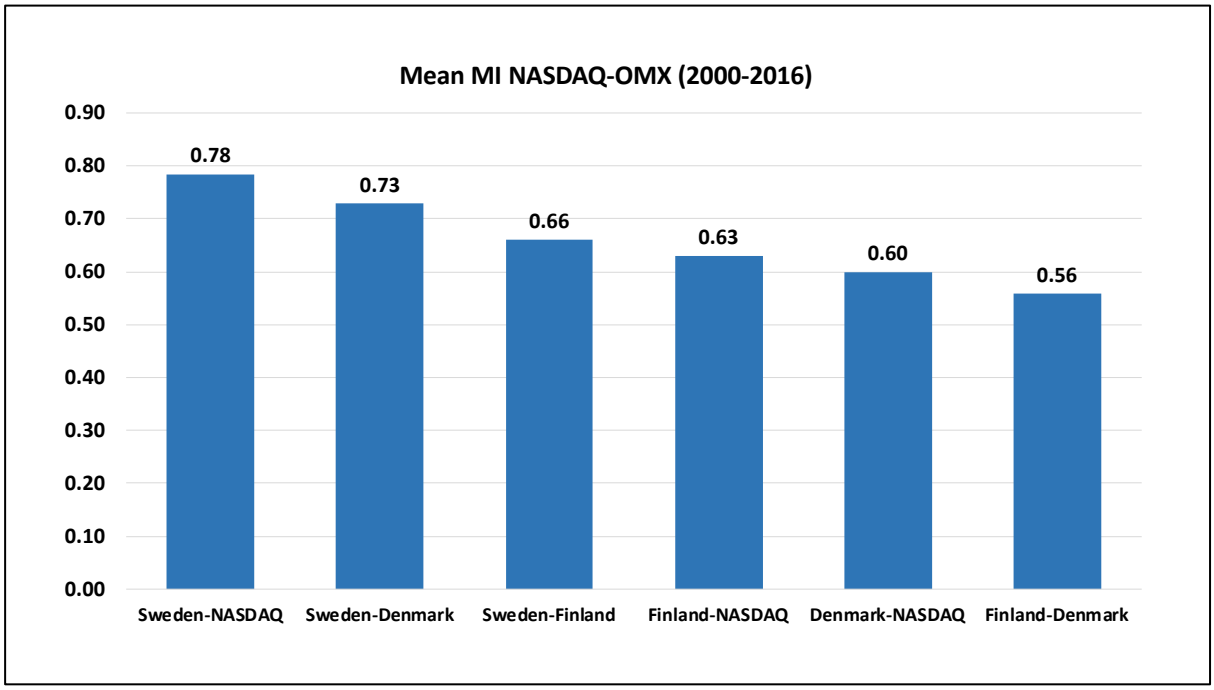
Note: Figure 4.2 shows the mean MI of stock market pair under NYSE-EURONEXT during the year 2000-2016. The stock market pair that has the highest mean MI is Netherland-France (0.94), followed by Netherland-Belgium (0.85), NYSE-France (0.84), NYSE-Netherland (0.83), France-Belgium (0.80), Portugal-France (0.75), Portugal-Netherland (0.69), NYSE-Belgium (0.65), Portugal-Belgium (0.64) and the stock market pair with lowest mean MI is NYSE-Portugal (0.63).

Figure 4.3 shows the mean MI of stock market pair under NASDAQ-OMX during the year 2000-2016. The stock market pair that has the highest MI is Sweden- NASDAQ (0.78), followed by Sweden-Denmark (0.73), Sweden-Finland (0.66), Finland-NASDAQ (0.63), Denmark-NASDAQ (0.60) and the stock market pair with lowest mean MI is Finland-Denmark (0.56).

It might seem to be counter-intuitive that Finland-Denmark has the lowest mean MI comparing to other country pairs within the NASDAQ-OMX consolidation group as the two countries are geographically close. The result shows that the degree of MI is not related to the geographic location and this is why we conduct the analysis controlling for other macro variables that reflect each country characteristics in details.

However, when looking at the value, the mean MI is not that different from other country pair within the same region. The mean value for Finland and Denmark is 0.56 while those of Sweden and Finland is 0.66.

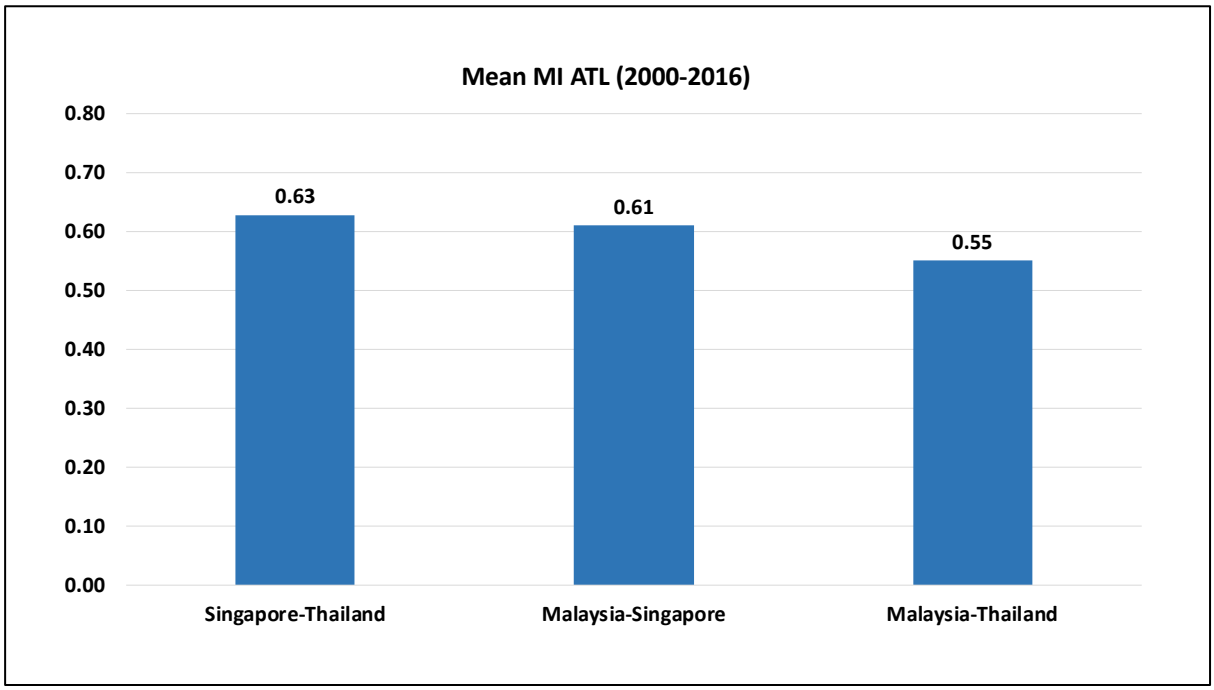
Figure 4.3 Mean MI for NASDAQ-OMX stock market pair (2000-2016)



Note: Figure 4.3 shows the mean MI of stock market pair under NASDAQ-OMX during the year 2000-2016. The stock market pair that has the highest MI is Sweden- NASDAQ (0.78), followed by Sweden-Denmark (0.73), Sweden-Finland (0.66), Finland-NASDAQ (0.63), Denmark-NASDAQ (0.60) and the stock market pair with lowest mean MI is Finland-Denmark (0.56).

Figure 4.4 shows the mean MI of stock market pair under ATL during the year 2000-2016. The stock market pair that has the highest MI is Singapore-Thailand (0.63), followed by Malaysia-Singapore (0.61) and the stock market pair with the lowest mean MI is Malaysia-Thailand (0.55).

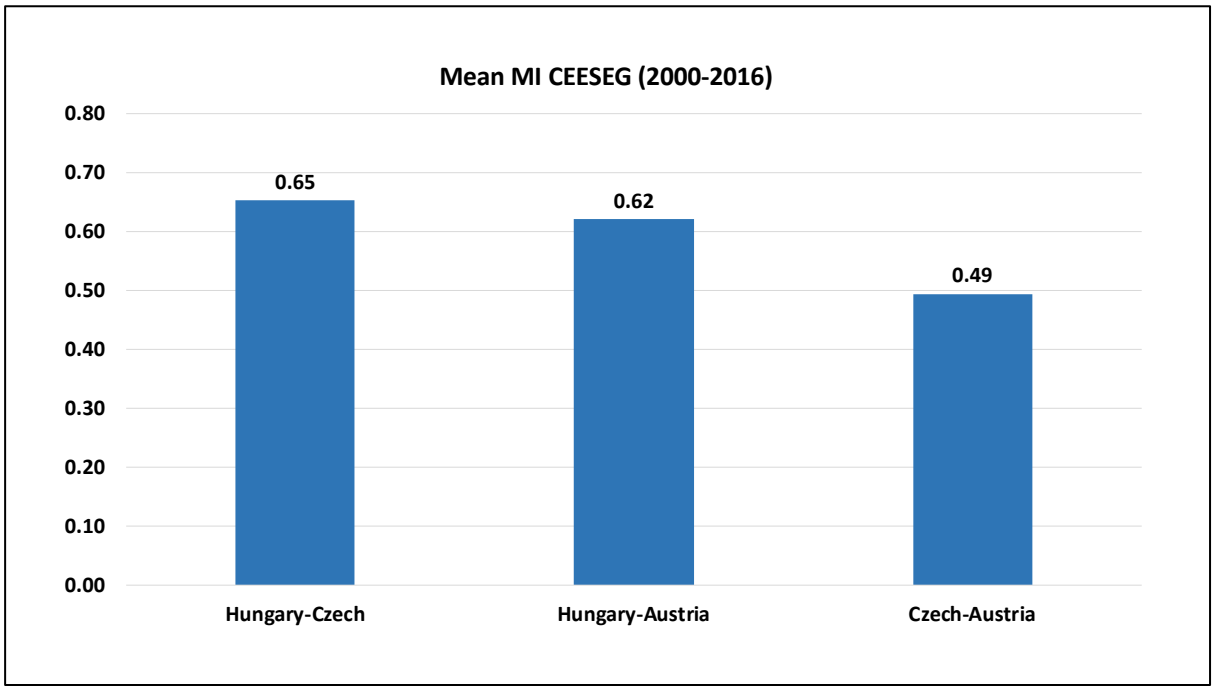
Figure 4.4 Mean MI for ATL stock market pair (2000-2016)



Note: Figure 4.4 shows the mean MI of stock market pair under ATL during the year 2000-2016. The stock market pair that has the highest MI is Singapore-Thailand (0.63), followed by Malaysia-Singapore (0.61) and the stock market pair with the lowest mean MI is Malaysia-Thailand (0.55).

Figure 4.5 shows the mean MI of stock market pair under CEESEG during the year 2000-2016. The stock market pair that has the highest MI is Hungary-Czech Republic (0.65), followed by Hungary-Austria (0.62) and the stock market pair with the lowest mean MI is Czech Republic-Austria (0.49).

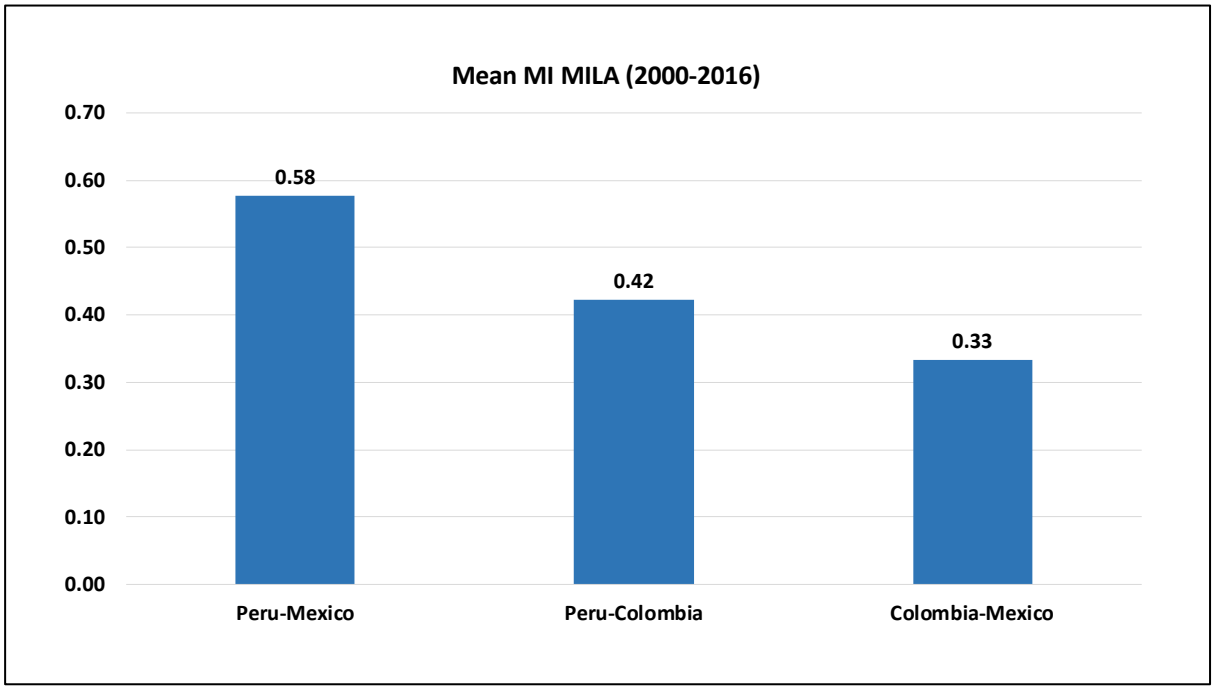
Figure 4.5 Mean MI for CEESEG stock market pair (2000-2016)



Note: Figure 4.5 shows the mean MI of stock market pair under CEESEG during the year 2000-2016. The stock market pair that has the highest MI is Hungary-Czech Republic (0.65), followed by Hungary-Austria (0.62) and the stock market pair with the lowest mean MI is Czech Republic-Austria (0.49).

Figure 4.6 shows the mean MI of stock market pair under MILA during the year 2000-2016. The stock market pair that has the highest MI is Peru-Mexico (0.58), followed by Peru-Colombia (0.42) and the stock market pair with the lowest mean MI is Colombia-Mexico (0.33).

Figure 4.6 Mean MI for MILA stock market pair (2000-2016)



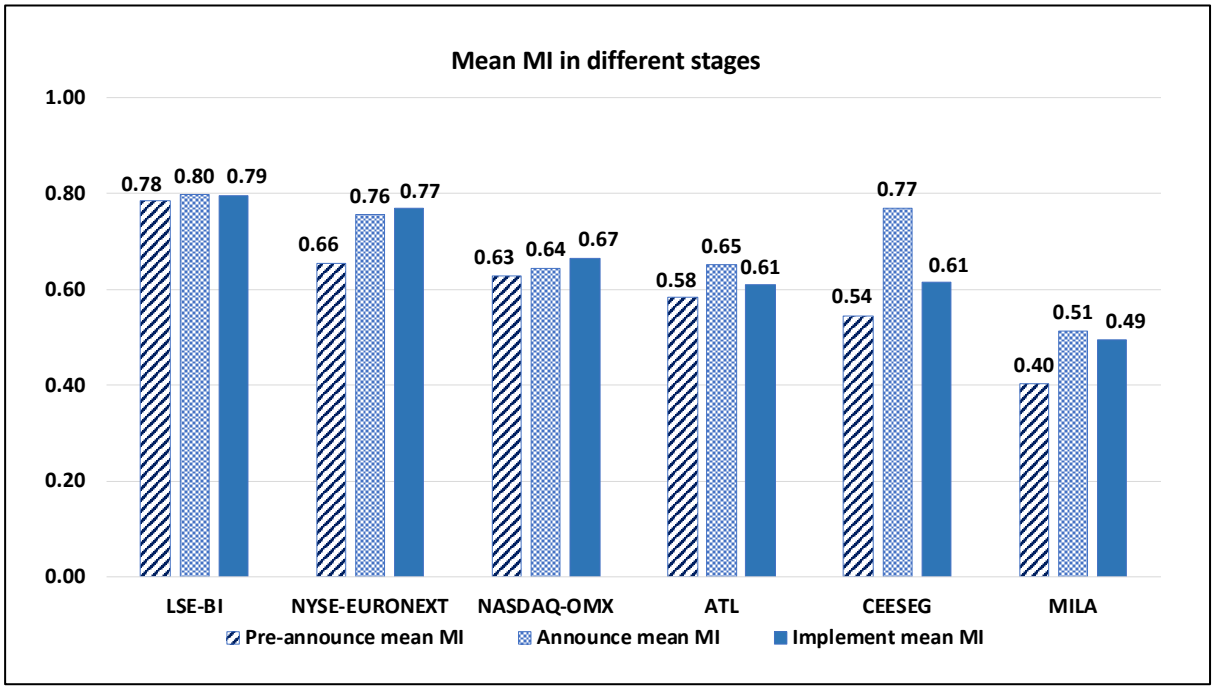
Note: Figure 4.6 shows the mean MI of stock market pair under MILA during the year 2000-2016. The stock market pair that has the highest MI is Peru-Mexico (0.58), followed by Peru-Colombia (0.42) and the stock market pair with the lowest mean MI is Colombia-Mexico (0.33).

When comparing the range of stock market pair MI across groups, the group with the highest rage of mean MI across stock market pair is NYSE-EURONEXT (0.31), followed by MILA (0.25), NASDAQ-OMX (0.22), CEESEG (0.16) and the group with lowest range is ATL (0.08).

4.4.2 Mean MI in different stages

We compare the mean MI for six stock market consolidation groups in the pre-announce, announce and implement stages. The stock market consolidation lowers investment barriers; thus, we expect the mean MI to increase after such event. According to **Figure 4.7,** mean MI increased for the announce and implement compared to the pre-announce stage for all the consolidation group implying that the stock markets are more integrated after the stock market consolidation.

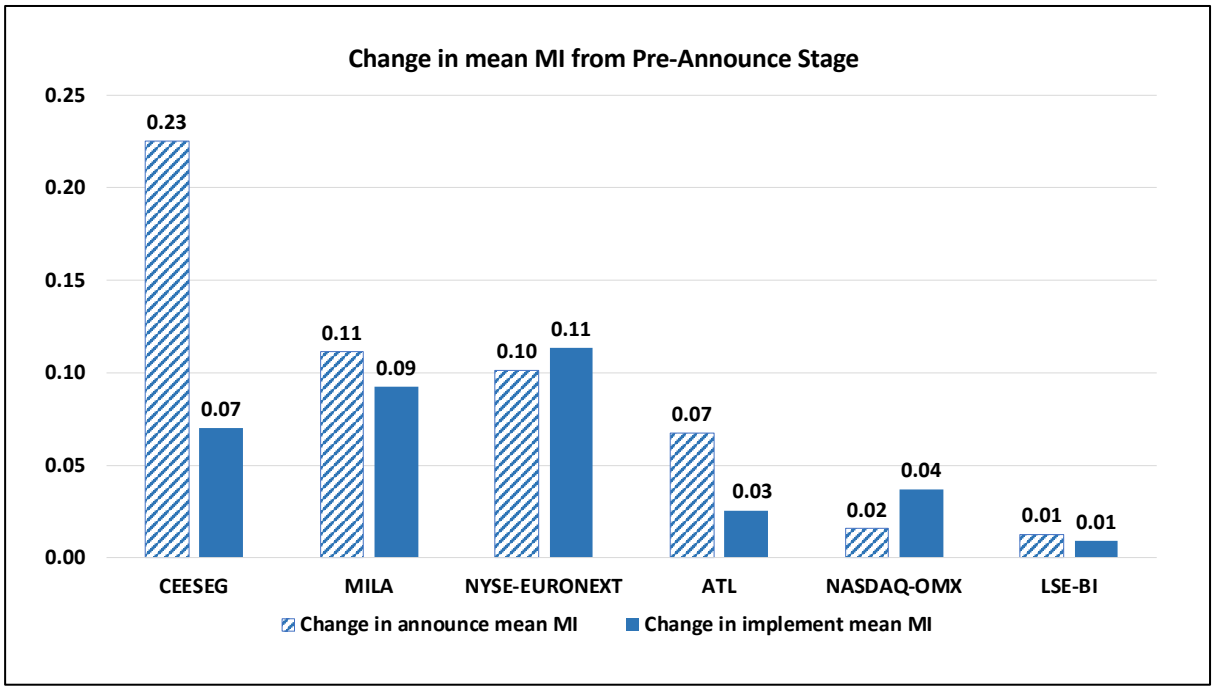
Figure 4.7 Mean MI for six stock market consolidation groups in different stages



Note: According to Figure 4.7, mean MI increased for the announce and implement compared to the pre-announce stage for all the consolidation group implying that the stock markets are more integrated after the stock market consolidation.

To make it easier to understand, we compare the change in mean MI of announce and implement stages from the pre-announce stage for each group. According to **Figure 4.8,** for announce stage, CEESEG has the highest increase (0.23) followed by MILA (0.11), NYSE-EURONEXT (0.10), ATL (0.07), NASDAQ-OMX (0.02), and the consolidation group with the lowest increase is LSE-BI (0.01). For implement stage, NYSE-EURONEXT has the highest increase (0.11) followed by MILA (0.09), CEESEG (0.07), NASDAQ-OMX (0.04), ATL (0.03), and the consolidation group with the lowest increase is LSE-BI (0.01).

Figure 4.8 Change in mean MI from pre-announce stage



Note: According to Figure 4.8, for announce stage, CEESEG has the highest increase (0.23) followed by MILA (0.11), NYSE-EURONEXT (0.10), ATL (0.07), NASDAQ-OMX (0.02), and the consolidation group with the lowest increase is LSE-BI (0.01). For implement stage, NYSE-EURONEXT has the highest increase (0.11) followed by MILA (0.09), CEESEG (0.07), NASDAQ-OMX (0.04), ATL (0.03), and the consolidation group with the lowest increase is LSE-BI (0.01).

4.4.3 Factors affecting MI

From the previous section, we can see that the mean MI for all six consolidation groups increased during the announcement and implement stages. However, this could be due to other factors, so we conduct the OLS fixed effect panel regression to see the effect of stock market consolidation on MI controlling for other factors such as financial crisis, market anomalies, exchange rate risk, stock market performance, real convergence and monetary policy convergence.

We analyze separately the effect of the ANNOUNCE and the IMPLEMENT stages on MI. We use a standard correlation of 36 months rolling window (SC) and DCC-MGARCH model (DCC) as measures of MI for the result shown in Model (1) MI_SC and Model (2) MI_DCC respectively. **Table 4.9** shows the OLS fixed effect panel regression result including the time fixed effect and consolidation group fixed effect.

For Model (1), the result shows that ANNOUNCE and IMPLEMENT statistically significantly increase MI by 0.042 and 0.038 respectively. For the control variable, the variable that has the highest positive and significant impact on MI is REALRATE (1.717) followed by CRISISEU (0.137), TRADE (0.071) and CRISISUS (0.065). Furthermore, the variable that has the highest negative and significant impact on MI is EXVOL (-3.482) followed by TERM (-1.505). However, JAN, MD, DY, VOL, GROWTH and IFL do not have a significant effect on MI. The R-square for model (1) is 0.19.

For Model (2), the result shows that ANNOUNCE and IMPLEMENT statistically significantly increase MI by 0.071 and 0.040 respectively. For the control variable, the variable that has the highest positive and significant impact on MI is REALRATE (1.903) followed by CRISISUS (0.037) and CRISISEU (0.034). Furthermore, the variable that has the highest negative and significant impact on MI is EXVOL (-3.394) followed by TERM (-1.630), DY (-1.206), VOL (-0.358), TRADE (-0.092) and MD (-0.018). However, JAN, GROWTH and IFL do not have a significant effect on MI. The R-square for model (2) is 0.17.

The result for the stock market consolidation effect on MI are robust across the two models where the ANNOUNCE and IMPLEMENT statistically significantly increases MI at 1% level with ANNOUNCE having higher economic significance than IMPLEMENT. For other control variables, the results are robust for CRISISUS, CRISISEU, EXVOL, TERM and REALRATE where the variables are statistically significant at 1% level. In addition, the result for JAN, GROWTH and IFL are also robust where the variables are not statistically significant. On the other hand, the result for MD, DY, VOL and TRADE are significant in model (2) but not in model (1).

Table 4.9 Fixed effect OLS panel regressions

Dependent Variable =	Model (1) MI_SC	Model (2) MI_DCC
ANNOUNCE	0.042***	0.071***
	(-0.01)	(-0.01)
IMPLEMENT	0.038***	0.040***
	(-0.01)	(-0.01)
CRISISUS	0.065***	0.037***
	(-0.01)	(-0.01)
CRISISEU	0.137***	0.034***
	(-0.01)	(-0.01)
JAN	-0.001	0.005
	(-0.01)	(-0.01)
EXVOL	-3.482***	-3.394***
	(-0.39)	(-0.34)
MD	-0.010	-0.018***
	(-0.01)	(0.00)
DY	-0.174	-1.206***
	(-0.17)	(-0.15)
VOL	-0.213	-0.358***
	(-0.13)	(-0.11)
GROWTH	-0.015	-0.090
	(-0.07)	(-0.06)
TRADE	0.071*	-0.092***
	(-0.03)	(-0.03)
TERM	-1.505***	-1.630***
	(-0.14)	(-0.12)
IFL	1.430	0.467
	(-0.86)	(-0.74)
REALRATE	1.717***	1.903***
	(-0.15)	(-0.13)
CONSTANT	0.569***	0.527***
	(-0.03)	(-0.02)
Obs	5,304	5,304
R-Square	0.19	0.17
Time FE	Yes	Yes
Group FE	Yes	Yes

Note: The dependent variable is the stock market integration index (*MI*) calculated from local currency return. *ANNOUNCE* is dummy for stock market consolidation announcement period. *IMPLEMENT* is the dummy for stock market consolidation implement period. Next, *CRISISUS* is the dummy for the global financial crisis started in the US. *CRISISEU* is the dummy for the European debt crisis. *JAN* is the January effect dummy. *EXVOL* is exchange rate volatility. *MD* is the stock market development. *DY* is the dividend yield. *VOL* is the dynamic standard deviation of return. *GROWTH* is the economic growth. *TRADE* is the trade openness. *TERM* is the term structure interest rate. *IFL* is the inflation rate. *REALRATE* is the real interest rate. Robust standard errors are shown in parentheses. For interpretation, the statistical significance is reported against 10% (*), 5% (**) and 1% (***) significance level.

4.5 Discussion

4.5.1 Comparison of MI between six stock market consolidation groups

Consistent with the hypothesis, the stock market consolidation groups that contain developed country stock markets (LSE-BI, NYSE-EURONEXT, NASDAQ-OMX) seems to have a higher mean MI comparing to those groups that contain emerging market country stock markets (ATL, CEESEG, MILA). This result is similar to the previous literature where the degree of MI for the developed countries tend to be higher than in the emerging market countries (Kim et al. 2006; Hwang 2012; Boubakri and Guillaumin 2011; Guesmi and Nguyen 2014; Guesmi et al. 2014).

4.5.2 Mean MI in different stages

Consistent with the hypothesis, we found that the mean MI for all the stock market consolidation groups increases after the stock market consolidation ANNOUNCE and IMPLEMENT comparing to the pre-announce period. Furthermore, the increase in mean MI of ANNOUNCE and IMPLEMENT stages from the pre-announce stage seems to be higher for the stock market consolidation groups that contain emerging market countries stock market (ATL, CEESEG, MILA) comparing to those groups that contain developed countries stock markets (LSE-BI, NYSE-EURONEXT, NASDAQ-OMX). This result is consistent with Arouri et al. (2012) who found that most emerging markets in their sample experienced a higher increase in MI following structural reforms and liberalization comparing to those of the developed markets.

4.5.3 Factors affecting MI

First, we found that there is a positive and statistically significant effect of ANNOUNCE and IMPLEMENT on MI with ANNOUNCE having higher impact than IMPLEMENT. **Table C-1** in **Appendix C** shows that the mean for ANNOUNCE is statistically and significantly higher than those of IMPLEMENT. This result is consistent with the hypothesis where ANNOUNCE and IMPLEMENT variables are expected to have a positive effect on MI. The ANNOUNCE period gives the signal to the investors that the stock markets will be consolidated in the future, but the investors can only trade stocks via local trading platform. Therefore, the effect of the increase in MI during this period comes mainly from the investors' speculations due to the better outlook of those countries under the consolidation

group. During the IMPLEMENT period, investors are facilitated to trade stock under the consolidated platform; thus, MI is expected to increase. Therefore, the fact that the impact of ANNOUCE is higher than IMPLEMENT might reflect that the effect from investors' speculation is higher than the effect of real trading activity.

Since this study is the first to look at the effect of stock market consolidation on MI, we have to compare our results to the literature that examines similar events. Consistent with previous studies, similar events of the formation of a political and economic union such as European Union (EU) has a positive and statistically significant effect on MI of the EU countries (Buttner and Hayo 2011; Kim et al. 2006; Dimitriou and Simos 2013).

Second, we found that there is a positive and statistically significant effect of CRISISUS and CRISISEU on MI which is consistent with the hypothesis where these two variables are expected to have a positive effect on MI since the stock markets are affected in the same direction. Our results are consistent with many previous studies which also found that MI increased during the financial crisis period (Erb et al. 1994; Longin and Solnik 2001; Lim 2009; Boubakri and Guillaumin 2011; Karim and Karim 2012; Arouri et al. 2012).

Third, there is a negative and statistically significant effect of EXVOL, MD, DY, VOL, TRADE and TERM on MI which is consistent with the hypothesis where these variables are expected to have a negative effect on MI since the higher the difference reflects the deviation in the stage of economy. Our results are consistent with many previous studies which also found that these variables have a statistically significant impact on MI.

Consistent with our result, many previous studies also found that EXVOL is a significant factor that affect MI (Bracker and Koch 1999; Guesmi et al. 2006; Kim et al. 2006; Guesmi et al. 2014; Valdes et al. 2016; Arouri et al. 2012). However, Buttner and Hayo (2011) Guesmi and Nguyen (2014) did not find that it is a significant factor.

Similar to our study, many studies also found that MD is a significant factor that affect MI (Guesmi et al. 2006; Buttner and Hayo 2011; Guesmi and Nguyen 2014; Valdes et al. 2016). Some studies found that DY is a significant factor that affect MI (Kim et al. 2006; Boubakri and Guillaumin 2011; Arouri et al. 2012) while the other study found it to be insignificant (Guesmi et al. 2006; Guesmi et al. 2014; Guesmi and Nguyen 2014; Valdes et al. 2016).

Bracker and Koch (1999) and Valdes et al. (2016) found that VOL is a significant factor while Pretorius (2002) did not find that VOL is a significant factor that affect MI.
Consistent with our study, many studies found that TRADE is a negative and significant factor that affect MI (Pretorius 2002; Guesmi et al. 2006; Kim et al. 2006; Guesmi and Nguyen 2014; Valdes et al. 2016). For the study that also found the result to be negative, they use the difference in the trade openness between the country pair as in our study. However, the study that found it to be positive use the absolute value of the trade openness of the destination country. Even this variable is negatively and statistically significant in our study, some other studies found it to be insignificant using other sample stock markets and different time period (Bracker and Koch 1999; Guesmi et al. 2014). Similar to our study, many previous studies also found that TERM is a significant factor that affects MI (Bracker and Koch 1999; Kim et al. 2006; Guesmi et al. 2014; Guesmi and Nguyen 2014).

Next, there is a positive and statistically significant effect REALRATE on MI which is inconsistent with the hypothesis. However, there is also a possibility that these variables might have a positive effect on MI if the investors see that the difference in the stage of the economy reflect the diversification opportunity and invest in both countries to gain diversification benefit. Consistent with our result, Bracker and Koch (1999) found that REALRATE has a significant effect on MI while the other studies found it to be insignificant (Pretorius 2002; Kim et al. 2006; Buttner and Hayo 2011; Boubakri and Guillaumin 2011).

Finally, we found that JAN, GROWTH and IFL do not have a statistically significant effect on MI. Kim et al. (2006) did not find that JAN is a significant factor that affect MI which is similar to our study. Many studies found that GROWTH is an insignificant factor (Bracker and Koch 1999; Guesmi et al. 2006; Guesmi et al. 2014; Guesmi and Nguyen 2014) while others found it to be significant (Pretorius 2002; Kim et al. 2006). Consistent with our result, Bracker and Koch (1999), Pretorius (2002), Kim et al. (2006) and Mukherjee (2007) did not find that IFL is a significant factor that affect MI while other studies found it to be significant (Guesmi et al. 2006; Guesmi et al. 2014; Guesmi and Nguyen 2014; Valdes et al. 2016; Boubakri and Guillaumin 2011).

4.6 Conclusion

Due to the recent trends of stock market consolidations around the world, we are interested in investigating whether this event has a significant effect on MI. While the degree and the determinants of MI have been widely studied, none of the previous studies have examined the effect of the stock market consolidation on MI. We decompose stages of stock market consolidation into ANNOUNCE and IMPLEMENT period to distinguish the effect from each period. The first objective is to compare MI between six stock market consolidation groups. The second objective is to compare mean MI in different stages. Finally, the third objective is to examine the factors affecting MI especially the effect of ANNOUNCE and IMPLEMENT on MI controlling for other control variables.

Following the first objective, we compare the mean MI for six stock market consolidation groups in our sample during the year 2000-2016. Consistent with the hypothesis, we found that the stock market consolidation groups that contain developed country stock markets (LSE-BI, NYSE-EURONEXT, NASDAQ-OMX) seems to have a higher mean MI compared to those groups that contain emerging market country stock markets (ATL, CEESEG, MILA).

To answer the second objective, we compare the mean MI for six stock market consolidation groups in the pre-announce, ANNOUNCE and IMPLEMENT stages. We found that mean MI increased for the ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage for all the consolidation group implying that the stock markets are more integrated after the stock market consolidation. Consistent with the hypothesis, the increase of mean MI of ANNOUNCE and IMPLEMENT stages from the pre-announce stage seems to be higher for the stock market consolidation groups that contain emerging market countries stock market (ATL, CEESEG, MILA) comparing to those groups that contain developed countries stock markets (LSE-BI, NYSE-EURONEXT, NASDAQ-OMX).

According to the third objective, we examine the factors affecting MI especially the effect of ANNOUNCE and IMPLEMENT on MI controlling for other control variables. Consistent with the hypothesis, we found that there is a positive and statistically significant effect of ANNOUNCE and IMPLEMENT on MI with ANNOUNCE having higher impact than IMPLEMENT reflecting that the effect from investors' speculation is higher than the effect from real trading activity. For the other control variables, CRISISUS and CRISISEU and

REALRATE have a positive and significant impact on MI while EXVOL, TERM, DY, VOL, TRADE and MD have a negative and significant impact on MI. However, JAN, GROWTH and IFL do not have a statistically significant effect on MI.

Chapter 5: Stock Market Consolidation and Diversification Benefit

5.1 Introduction and literature review

The stock market consolidation plan is believed to increase the degree of MI which will eventually decrease the diversification benefit (DB). Therefore, it is also important to achieve a better understanding of how the stock market consolidation event affect the degree of DB.

The objectives of this chapter are to compare US DB between six stock market consolidation groups, compare mean US DB in different stages and examine the factors affecting US DB especially the effect of different stages of the stock market consolidation on US DB controlling for numerous economic and stock market characteristics.

In this study, we use DCC-MGARCH between the stock market index return to measure DB index. We will also use SC as a robust measure of DB. The objective of this empirical essay is to focus on US investors diversification benefit toward 18 destination countries around the world that experienced stock market consolidation during the year 2000-2016. US investor is chosen because US is part of two stock market consolidations under the period of study. Thus, choosing the US as a home country can distinguish between the effect of the attractiveness of the destination countries consolidation group and the ease of being under the same stock market consolidation group.

Many studies have examined the development of DB over time (Christoffersen et al. 2014; Miralles-Marcelo et al. 2015; Thanakijsombat and Kongtoranin 2018; Meric et al. 2008; Meric et al. 2011; Statman and Scheid 2008; Delcoure 2010). However, only a few studies look at the factors that drive DB (Lee et al. 2016; Cotter et al. 2018). This study is the first to look at the effect of stock market consolidation on US DB.

Correlation-based DB is widely used by the previous literature (Bekaert and Harvey 1995; Grubel 1968; Lessard 1973; Harvey 1995). Christoffersen et al. (2014) argue that use the heteroskedasticity-adjusted correlation-based measure DCC-MGARCH is a more accurate measure of DB comparing to rolling SC as it does not depend on the rolling window.

The rest of the chapter is organized as followed: 5.2 gives the data and variables including sample, variable description, expected sign and hypothesis and descriptive statistics. 5.3 shows the methodology including the conceptual and empirical model. 5.4 provides the result following the objectives of the study. 5.5 discusses the result and 5.6 concludes the key takeaway from the chapter.

5.2 Data and Variables

5.2.1 Sample

We estimated the bilateral dynamic conditional correlation for the US with 18 destination countries. **Table D-1** in **Appendix D** lists these destination countries as well as the stock markets and the consolidation timeline. Our sample covers the 2000-2016 period so that we have the data for the pre-and the post-consolidation years for the six stock market consolidations. Monthly data is used to avoid daily and weekly market anomalies. There are three subsamples used in this study as we would like to distinguish the result of the consolidation groups that include the US stock market and the consolidation groups that exclude the US stock market.

For the consolidation groups that include the US stock market, the first sample is NYSE-EURONEXT group. We derive the sample using the step shown in **Table 5.1**. Starting with 816 observation from the chosen countries and sample period, we do not have any missing data, so the final sample consists of 816 country-month observations.

Table 5.1 NYSE-EURONEXT Sample Selection

Sample Selection 2000-2016	
	Observations
Chosen countries and sample period	816
Final Sample	816

Note: We derive the sample using the step shown in **Table 5.1**.

The final sample of stock market includes Amsterdam Stock Exchange (Netherland), Brussels Stock Exchange (Belgium), Paris Stock Exchange (France), Lisbon Stock Exchange (Portugal) and NYSE (USA). In this sample, the stock market consolidation announcement and implement date is the date that these stock market consolidated with NYSE (USA). **Table 5.2** summarizes the final sample of stock markets under NYSE-EURONEXT and the stock markets consolidation announcement and implement date.

Table 5.2 NYSE-EURONEXT Announcement and Implement Date

Consolidation Group	Stock Market Index	Announcement	Implement
NYSE-EURONEXT	Amsterdam Stock Exchange (Netherland)	June 2006	April 2007
	Brussels Stock Exchange (Belgium)	June 2006	April 2007
	Paris Stock Exchange (France)	June 2006	April 2007
	Lisbon Stock Exchange (Portugal)	June 2006	April 2007

Note: Table 5.2 summarizes the final sample of stock markets under NYSE-EURONEXT and the stock markets consolidation announcement and implement date.

For the consolidation groups that include the US stock market, the second sample is NASDAQ-OMX group. We derive the sample using the step shown in **Table 5.3**. Starting with 1,020 observation from the chosen countries and sample period, we lose 204 observation from missing data from MSCI database. Furthermore, and we lose 204 observations where the data are missing for the control variable. The final sample consists of 612 country-month observations.

Table 5.3 NASDAQ-OMX Sample Selection

Sample Selection 2000-2016	
	Observations
Chosen countries and sample period	1,020
Less: Observation with missing data from MSCI database	(204)
Less: Observation with missing data for the control variables	(204)
Final Sample	612

Note: We derive the sample using the step shown in Table 5.3.

The final sample of stock market includes the Stockholm Stock Exchange (Sweden), Helsinki Stock Exchange (Finland) and Copenhagen Stock Exchange (Denmark). In this sample, the stock market consolidation announcement and implement date is the date that these stock market consolidated with NASDAQ (USA). **Table 5.4** summarizes the final sample of stock markets under NASDAQ-OMX and the stock markets consolidation announcement and implement date.

Table 5.4 NASDAQ-OMX Announcement and Implement Date

Consolidation Group	Stock Market Index	Announcement	Implement
NASDAQ- OMX	Stockholm Stock Exchange (Sweden)	May 2007	February 2008
	Helsinki Stock Exchange (Finland)	May 2007	February 2008
	Copenhagen Stock Exchange (Denmark)	May 2007	February 2008

Note: Table 5.4 summarizes the final sample of stock markets under NASDAQ-OMX and the stock markets consolidation announcement and implement date.

For the consolidation groups that exclude the US stock market, the sample includes LSE-BI, MILA, CEESEG and ATL group. We derive the sample using the step shown in **Table 5.5**. Starting with 2,652 observation from the chosen countries and sample period, we lose 204 observation from missing data from MSCI database. Furthermore, and we lose 204 observations where the data are missing for the control variable. The final sample consists of 2,244 country-month observations.

Table 5.5 Sample Selection of consolidation groups that exclude US

Sample Selection 2000-2016	
	Observations
Chosen countries and sample period	2,652
Less: Observation with missing data from MSCI database	(204)
Less: Observation with missing data for the control variables	(204)
Final Sample	2,244

Note: We derive the sample using the step shown in Table 5.5.

The final sample of stock market includes London Stock Exchange (UK), Italian Stock Exchange (Italy), Budapest Stock Exchange (Hungary), Prague Stock Exchange (Czech Republic), Vienna Stock Exchange (Austria), Lima Stock Exchange (Peru), Colombia Stock Exchange (Colombia), Mexican Stock Exchange (Mexico), Bursa Malaysia (Malaysia), Singapore Exchange (Singapore), Stock Exchange of Thailand (Thailand).

Table 5.6 summarizes the final sample of stock markets for the consolidation groups that exclude the US stock market and the stock markets consolidation announcement and implement date.

Table 5.6 Announcement and Implement Date of consolidation groups that exclude US

Consolidation Group	Stock Market Index	Announcement	Implement
LSE-BI	London Stock Exchange (UK)	June 2007	October 2007
	Italian Stock Exchange (Italy)	June 2007	October 2007
CEESEG	Budapest Stock Exchange (Hungary)	November 2008	January 2010
	Prague Stock Exchange (Czech Republic)	November 2008	January 2010
	Vienna Stock Exchange (Austria)	November 2008	January 2010
MILA	Lima Stock Exchange (Peru)	September 2009	May 2011
	Colombia Stock Exchange (Colombia)	September 2009	May 2011
	Mexican Stock Exchange (Mexico)	July 2014	December 2014
ATL	Bursa Malaysia (Malaysia)	April 2011	September 2012
	Singapore Exchange (Singapore)	April 2011	September 2012
	Stock Exchange of Thailand (Thailand)	April 2011	October 2012

Note: Table 5.6 summarizes the final sample of stock markets for the consolidation groups that exclude the US stock market and the stock markets consolidation announcement and implement date.

5.2.2 Variable Description

The dependent variable of diversification benefit (DB) is calculated from one minus DCC between US and 18 destination countries stock market return under each stock market consolidation group. The data of the price indices were obtained from NYSE, NASDAQ and Morgan Stanley Capital International (MSCI) via Datastream. For the dummy consolidation variables which are the variables of interest in this study, we included the dummy for the stock market consolidation announcement period (ANNOUNCE) which equals to 1 from the announcement date to the implement date and 0 otherwise and the dummy for stock market consolidation implement period (IMPLEMENT) which equals to 1 from the implement date until the end of the sample and 0 otherwise to distinguish between the effect from the announcement of the deal and the implementation of the deal. This data is obtained from the stock market consolidation's website.

We included the dummy control variable for the global financial crisis started in the US (CRISISUS) which equals to 1 during the period August 2007 to February 2009 and 0 otherwise and the dummy for the European debt crisis (CRISISEU) which equals to 1 during the period December 2009 to July 2011 and 0 otherwise. The crisis period data are obtained from the International Monetary Fund (IMF)'s World Economic Outlook (WEO) crisis and recovery report. We also include the January effect (JAN) which equals to 1 in January and 0 otherwise to control for the seasonal market anomaly (Kim et al. 2006).

We also control for the exchange rate risk (EXVOL) calculated from conditional volatility generated from an AR (1) process with GARCH (1,1) errors on ln $(REER_t/REER_{t-1})$ where REER is the real effective exchange rate. The dynamic standard deviation is then calculated from the square root of this volatility. The other variables are the stock market performance variables including stock market development (MD) proxy by monthly percentage change in market capitalization per Gross Domestic Product (GDP), dividend yield (DY) calculated from dividend per price and the stock market return volatility (VOL) calculated from conditional volatility generated from an AR (1) process with GARCH (1,1) errors on stock market return. The return is calculated from the ln $(PriceIndex_t/PriceIndex_{t-1})$ where the price index is expressed in terms of United States Dollar (USD). The dynamic standard deviation is then calculated from the square root of this volatility.

In addition, real convergence variable includes the economic growth (GROWTH) proxy by ln (IP_t/IP_{t-1}) where IP is seasonally adjusted industrial production index, trade openness (TRADE) proxy by monthly percentage change in total trade with the world per GDP and the term structure of interest rate (TERM) calculated from the difference between long-term interest rate and short-term interest rate where long-term and short-term interest rate are proxy by ten-year government bond and one-month interbank rate respectively.

The monetary policy convergence variable includes inflation (IFL) proxy by ln (CPI_t/CPI_{t-1}) where CPI is seasonally adjusted consumer price index and the real interest rate (REALRATE) calculated from the difference between the short-term nominal interest rate and inflation where short term nominal interest rate is proxy by one-month interbank rate. All above-mentioned control variables are in the form of absolute difference between the country pairs and the data is obtained from Datastream. All the variable definitions are summarized in **Table 5.7**.

Table 5.7 Variable Definitions

Category	Variables	Definition
Dependent Variable	DB	Diversification benefit calculated from one minus DCC between country pair under each stock market consolidation project. The value is normalized to 1
Dummy Consolidations	ANNOUNCE	Stock market consolidation announcement period (= 1 from the announcement date to the implement date and 0 otherwise)
	IMPLEMENT	Stock market consolidation implement period (= 1 from the implement date onward and 0 otherwise)
Dummy Control Variable	CRISISUS	US global financial crisis (= 1 during the period August 2007 to February 2009 and 0 otherwise)
	CRISISEU	European debt crisis (= 1 during the period December 2009 to July 2011 and 0 otherwise)
	JAN	January Effect (= 1 in January and 0 otherwise)
Exchange Rate Risk	EXVOL	Exchange Rate Volatility calculated from conditional volatility generated from an AR (1) process with GARCH (1,1) errors on ln $(ExRate_t/ExRate_{t-1})$. Exchange rate is expressed in terms of REER. The dynamic standard deviation is then calculated from square root of this volatility.
Stock Market Performance	MD	Stock Market Development proxy by monthly percentage change in market capitalization/GDP
	DY	Dividend Yield (dividend/price)
	VOL	Stock market return volatility calculated from conditional volatility generated from an AR (1) process with GARCH (1,1) errors on stock market return. The return is calculated from the ln $(PriceIndex_t/PriceIndex_{t-1})$ where the price index is expressed in terms of United States Dollar. The dynamic standard deviation is then calculated from square root of this volatility.
Real Convergence	GROWTH	Economic Growth proxy by ln (IP_t/IP_{t-1}) where IP is seasonally adjusted industrial production index
	TRADE	Trade Openness proxy by monthly percentage change in total trade with the world/GDP
	TERM	Term structure of Interest Rate (Long-term interest rate - Short-term interest rate) long-term and short-term interest rate proxy by ten-year government bond and one-month interbank rate respectively
Monetary Policy Convergence	IFL	Inflation rate proxy by ln (CPI_t/CPI_{t-1}) where CPI is seasonally adjusted consumer price index
	REALRATE	Real Short-Term Interest Rate calculated from short-term nominal interest rate – inflation where short term nominal interest rate is proxy by one-month interbank rate

Note: All the variable definitions are summarized in Table 5.7.

5.2.3 Expected Sign and Hypothesis

For the comparison of US DB across consolidation groups, the hypothesis is that the mean of the US DB for the emerging countries should be higher than the developed countries as found by many previous literatures. We also expect the mean US DB for the consolidation groups that exclude US stock markets to be higher than those of the group that include the US stock markets.

When looking at the mean US DB in different period, for consolidation groups that include US stock markets, we expect the mean US DB to decrease for both the ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage as the stock market return correlation for the stock markets under these consolidation groups should increase during this time. The IMPLEMENT stage should have a higher decrease than the ANNOUNCE as

it is the stage where stock markets under the consolidation groups is allowed to trade under the common trading platform.

For consolidation groups that exclude US stock markets, we expect the mean US DB to decrease for both ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage as the bigger consolidated markets make these stock markets more attractive to invest in and the stock market return correlation between US and these markets might increase. However, the mean US HB for the stock markets under consolidation groups that exclude US stock markets might increase during ANNOUNCE and IMPLEMENT stages as the US stock markets might become more integrated with its own group but less integrated with other groups.

When analyzing the factors affecting US DB, for the consolidation group that include US stock markets, the ANNOUNCE and IMPLEMENT variables are expected to have a negative effect on US DB as the stock market return correlation should increase during this period. For the groups that exclude US stock markets, we also expect the ANNOUNCE and IMPLEMENT to have a negative effect as the bigger consolidated markets make these stock markets more attractive to invest in and the stock market return correlation between US and these markets might increase. However, there is also a possibility that ANNOUNCE and IMPLEMENT might have a positive effect on US DB since as the US stock markets might become more integrated with its own group but less integrated with other groups.

We expect that US DB should decrease during the CRISISUS, CRISISEU and JAN since the stock markets are affected in the same direction. We predict that the control variable of the absolute difference in exchange rate risk, stock market performance, real convergence and monetary policy convergence should have a positive effect on US DB as the higher the difference reflects the deviation in the stage of economy. However, there is also a possibility that these variables might have a negative effect on US DB if the investors see that the difference in the stage of the economy reflect the diversification opportunity and invest in both countries to gain diversification benefit. **Table 5.8** summarizes the expected sign for each independent variable.

Table 5.8 Expected sign

Independent Variables	Expected Sign
ANNOUNCE	-
IMPLEMENT	-
CRISISUS	-
CRISISEU	-
JAN	-
EXVOL	+
MD	+
DY	+
VOL	+
GROWTH	+
TRADE	+
TERM	+
IFL	+
REALRATE	+

Note: Table 5.8 summarizes the expected sign for each independent variable.

5.2.4 Descriptive Statistics

Descriptive statistics including the mean, standard deviation, minimum, maximum, skewness, kurtosis and the augmented Dicky-Fuller (ADF) unit root test for stationarity for the dependent and independent variables can be found in **Table 5.9**. The skewness range that the data would consider to be normal is between -2 and +2. DB, EXVOL, DY and VOL variables are in the normal range while the MD, GROWTH, TRADE, TERM, IFL, REALRATE, shows a sign of a little bit right-skewed. For the normal distribution, the kurtosis value should be equal to 3. DB and VOL have the kurtosis value that is very close to 3 while the other variable shows to some extent the degree of leptokurtic or fat tails. The ADF test result shows that all of the variable rejects the null hypothesis and the variables are stationary. The skewness, kurtosis and unit root test are not conducted for the dummy variable.

Table 5.9 Descriptive Statistics

Variables	Mean	SD	Min	Max	Skewness	Kurtosis	ADF
DB	0.408	0.201	0	1	0.235	2.107	-2.966***
ANNOUNCE	0.086	0.281	0	1	-	-	-
IMPLEMENT	0.506	0.500	0	1	-	-	-
CRISISUS	0.093	0.291	0	1	-	-	-
CRISISEU	0.098	0.297	0	1	-	-	-
JAN	0.083	0.276	0	1	-	-	-
EXVOL	0.027	0.010	0	0.095	0.664	6.084	-2.987***
MD	0.316	0.315	0	5.677	4.276	47.822	-9.704***
DY	0.012	0.011	0	0.099	2.065	8.915	-2.789***
VOL	0.027	0.019	0	0.129	1.202	4.875	-3.624***
GROWTH	0.021	0.023	0	0.298	3.662	26.763	-8.977***
TRADE	0.062	0.068	0	0.520	2.225	9.424	-9.339***
TERM	0.011	0.011	0	0.142	3.736	25.203	-3.571***
IFL	0.002	0.002	0	0.027	2.844	17.349	-9.794***
REALRATE	0.017	0.018	0	0.180	2.217	10.479	-3.864***

Note: Descriptive statistics including the mean, standard deviation, minimum, maximum, skewness, kurtosis and the augmented Dicky-Fuller (ADF) unit root test for stationarity for the dependent and independent variables can be found in Table 5.9.

A pairwise correlation matrix is reported in **Table 5.10,** where correlation significant at the 5% level or better are highlighted in bold. Consistent with the hypothesis, we find that ANNOUNCE and IMPLEMENT are significantly and negatively correlated with DB. Furthermore, none of the correlation exceeds 0.5 and according to **Table 5.11**, we find that the average value of Variance-Inflation-Factors (VIFs) is 1.20 and none of the VIFs exceeds 10.0, indicating that the multicollinearity is not an issue in our regressions.

Table 5.10 Pairwise Correlation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) DB	1														
(2) ANNOUNCE	**-0.08**	1													
(3) IMPLEMENT	**-0.33**	**-0.31**	1												
(4) CRISISUS	**-0.05**	**-0.04**	**-0.01**	1											
(5) CRISISEU	**-0.11**	**0.06**	**0.11**	**-0.11**	1										
(6) JAN	-0.01	-0.01	-0.01	0.02	0.02	1									
(7) EXVOL	**-0.21**	**0.05**	**0.19**	**0.07**	**0.12**	0.01	1								
(8) MD	**0.05**	-0.01	**-0.09**	**0.08**	-0.01	**0.09**	0.01	1							
(9) DY	-0.03	**0.04**	**0.19**	**0.11**	-0.01	-0.01	**0.22**	**-0.03**	1						
(10) VOL	**0.23**	0.03	**-0.16**	-0.01	0.01	0.01	**0.21**	0.01	0.01	1					
(11) GROWTH	**0.07**	0.01	**-0.04**	**0.08**	0.01	**-0.03**	**-0.08**	-0.01	0.01	**0.03**	1				
(12) TRADE	**0.06**	**0.03**	-0.01	0.03	**0.05**	0.01	**0.04**	-0.01	**0.06**	**0.14**	**0.05**	1			
(13) TERM	**0.21**	-0.01	**-0.18**	-0.01	**-0.07**	0.02	**0.04**	0.02	**0.09**	**0.15**	0.02	**-0.04**	1		
(14) IFL	**0.07**	-0.01	**-0.12**	**0.19**	**-0.07**	**-0.03**	**0.08**	0.02	**0.06**	**0.13**	**0.05**	0.02	**0.05**	1	
(15) REALRATE	**0.22**	0.01	**-0.29**	**0.05**	**-0.07**	0.01	**0.18**	**0.04**	**-0.17**	**0.30**	0.01	0.01	**0.35**	**0.14**	1

Note: A pairwise correlation matrix is reported in Table 5.10, where correlation significant at the 5% level or better are highlighted in bold.

Table 5.11 Variance-Inflation-Factors (VIFs)

Variables	VIFs
DB	1.35
ANNOUNCE	1.21
IMPLEMENT	1.54
CRISISUS	1.10
CRISISEU	1.06
JAN	1.01
EXVOL	1.35
MD	1.03
DY	1.21
VOL	1.24
GROWTH	1.03
TRADE	1.04
TERM	1.22
IFL	1.09
REALRATE	1.48
Mean VIFs	1.20

Note: according to Table 5.11, we find that the average value of Variance-Inflation-Factors (VIFs) is 1.20 and none of the VIFs exceeds 10.0, indicating that the multicollinearity is not an issue in our regressions.

5.3 Methodology

5.3.1 Conceptual Model

According to Christoffersen et al. (2014), correlation-based diversification benefit can be calculated from correlation-based MI from equation **(5.1)**

$$\boldsymbol{DB_{ij,t} = 1 - MI_{ij,t}} \quad \textbf{(5.1)}$$

where $DB_{ij,t}$ is the diversification benefit of country i toward country j at time t and $MI_{ij,t}$ is the dynamic conditional correlation of country i toward country j at time t. In this chapter, the home country i is US and country j is each the destination countries under each stock market consolidation groups. As mentioned in chapter 4, MI is measured by the dynamic conditional correlations between stock market returns calculated from equation **(5.2)**

$$\boldsymbol{MI_{ij,t} = \rho_{ij,t} = \frac{q_{ij,t}}{\sqrt{q_{i,t}q_{j,t}}}} \quad \textbf{(5.2)}$$

The return for each country stock index is calculated from the formula $R_t = ln\, P_t - ln\, P_{t-1}$ where R_t is the return of the stock market index at time t, $ln\, P_t$ is the natural log of the stock market price index at time t and $ln\, P_{t-1}$ is the natural log of the stock market price index at time t – 1. The price index is expressed in terms of United States Dollar (USD) as we want to see from the perspective of the US investors. As MI is normalized to 1, according to equation **(5.1)**, DB equals to 1 means full diversification benefit while DB equals to 0 means no diversification benefit.

We will use the standard correlation (SC) with 36 months rolling window as a robustness check measure of MI. SC is calculated from the Pearson correlation coefficient formula shown in equation **(5.3)**

$$\boldsymbol{\rho_{xy} = \frac{Cov\,(r_x, r_y)}{\sigma_x \sigma_y}} \quad \textbf{(5.3)}$$

where r_x is the return for stock market x, r_y is the return for the stock market y, σ_x is the variance for stock market x and σ_y is the variance of the stock market y. We then use the rolling method with 36 months window to see the dynamic of SC. 36 months is chosen instead of a shorter period to decrease the noise of the data. SC is normalized to 1 with 1 meaning the stock markets are fully integrated while 0 meaning the stock market are not integrated. As MI is normalized to 1, DB equals to 1 means full diversification benefit while DB equals to 0 means no diversification benefit.

5.3.2 Empirical Model

To investigate the stock market consolidations effect on US DB, we employed a fixed effect OLS panel regression to estimate equation **(5.4)**. We use fixed effect as the Hausman test suggests that the fixed effect is preferred to the random effect model (**Table B-5** and **B-6** in **Appendix B**). Independent variable of different stages of stock market consolidation ANNOUNCE and IMPLEMENT are included. We also include the control variable of the US global financial crisis, Euro debt crisis, January effect exchange rate risk, incentive of investment, real convergence and monetary policy convergence.

$$\mathbf{DB}_{i,t} = \alpha_{i,t} + \beta_1 ANNOUNCE_{i,t} + \beta_2 IMPLEMENT_{i,t} + \beta_3 CRISISUS_{i,t} + \beta_4 CRISISEU_{i,t} + \beta_5 JAN_{i,t} + \beta_6 EXVOL_{i,t-1} + \beta_7 MD_{i,t-1} + \beta_8 DY_{i,t-1} + \beta_9 VOL_{i,t-1} + \beta_{10} GROWTH_{i,t-1} + \beta_{11} TRADE_{i,t-1} + \beta_{12} TERM_{i,t-1} + \beta_{13} IFL_{i,t-1} + \beta_{14} REALRATE_{i,t-1} + \varepsilon_{i,t} \quad \textbf{(5.4)}$$

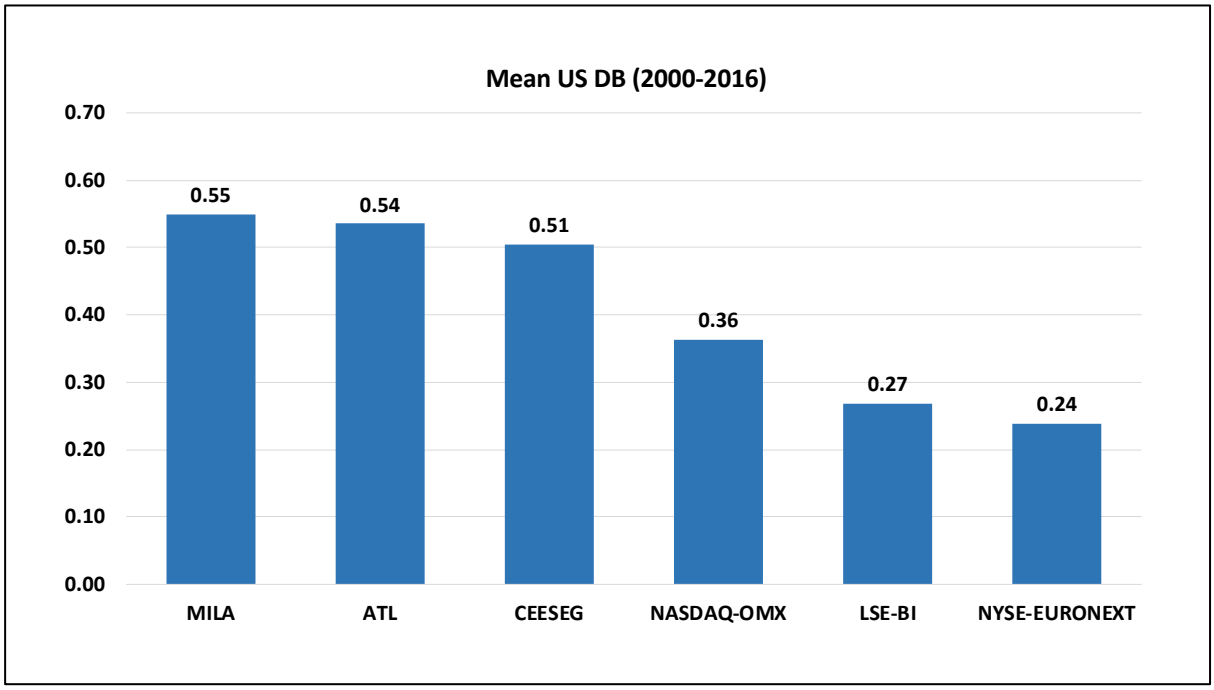
To make sure that the result is robust, we will report Newey-West robust standard error in the result to avoid potential issue arising from heteroscedasticity and autocorrelation. To check for omitted variable bias issue, we apply the Ramsey reset test and found that there is no omitted variable bias in the model (**Table B-4** in **Appendix B**). We also solved for the reverse causality problem by including the lagged independent variable as shown in equation **(5.4)**. The result is clustered by the consolidation group to make sure that the result is not affected by the common characteristics within each group. To take into account for the outlier, all the variables are winsorized at a 95% confidence interval.

5.4 Result

5.4.1 Comparison of US DB

To see the overall picture, we compare the mean US DB for six stock market consolidation groups in our sample during the year 2000-2016. According to **Figure 5.1**, The stock market consolidation group that has a highest mean US DB is MILA (0.55) followed by ATL (0.54), CEESEG (0.51), NASDAQ-OMX (0.36), LSE-BI (0.27), and the group that has the lowest mean is NYSE-EURONEXT (0.24).

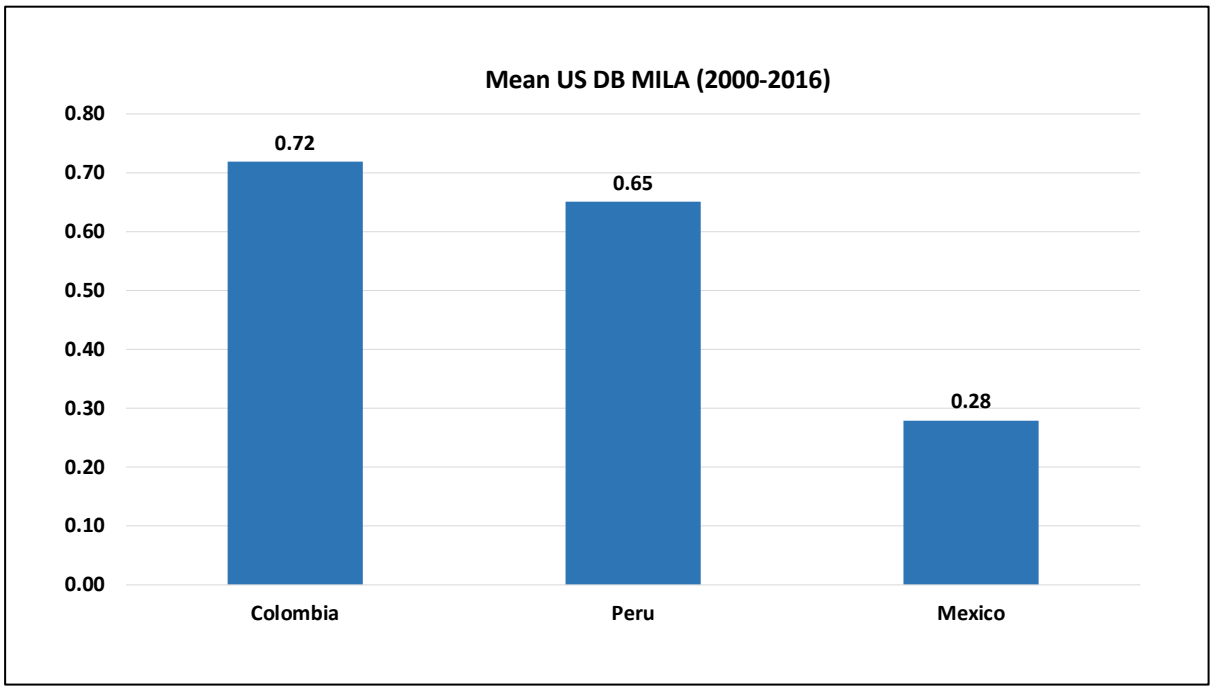
Figure 5.1 Mean US DB for six stock market consolidation groups (2000-2016)



Note: According to Figure 5.1, The stock market consolidation group that has a highest mean US DB is MILA (0.55) followed by ATL (0.54), CEESEG (0.51), NASDAQ-OMX (0.36), LSE-BI (0.27), and the group that has the lowest mean is NYSE-EURONEXT (0.24).

To look at US DB for each stock market consolidation groups in detail, we compare the mean US DB for each stock market within each group. **Figure 5.2** shows the mean US DB of the stock market under MILA during the year 2000-2016. The stock market that has the highest US DB is Colombia (0.72) followed by Peru (0.65) and Mexico (0.28).

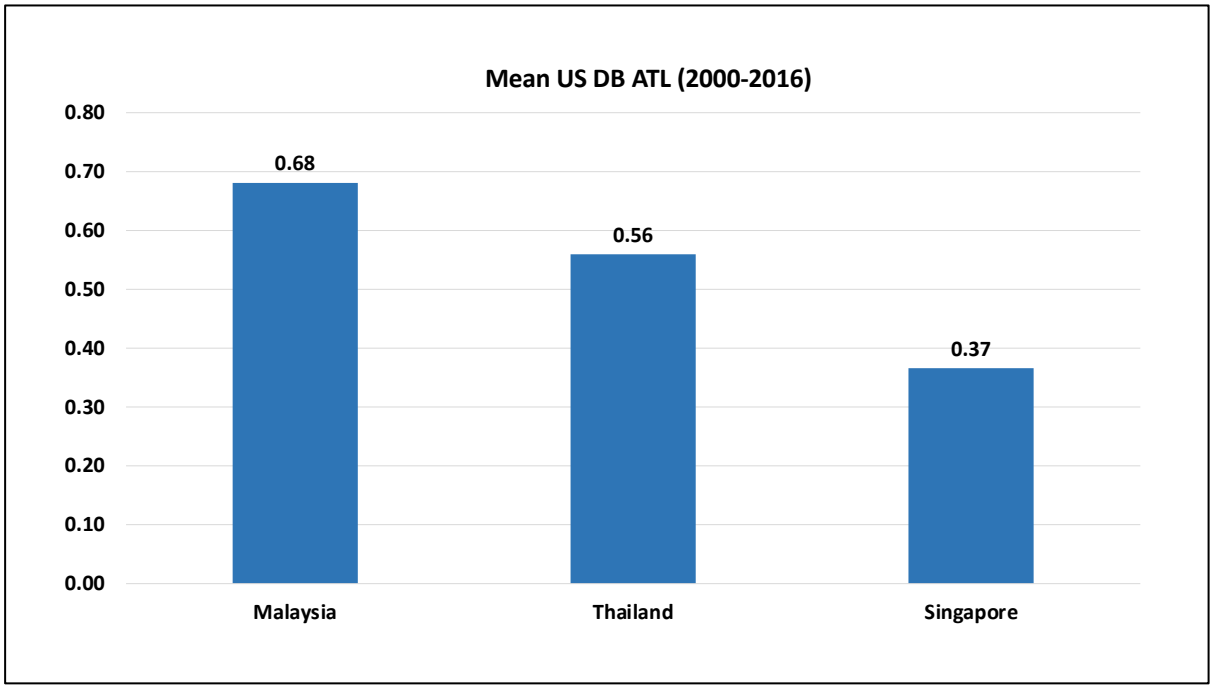
Figure 5.2 Mean US DB for MILA (2000-2016)



Note: Figure 5.2 shows the mean US DB of the stock market under MILA during the year 2000-2016. The stock market that has the highest US DB is Colombia (0.72) followed by Peru (0.65) and Mexico (0.28).

Figure 5.3 shows the mean US DB of the stock market under ATL during the year 2000-2016. The stock market that has the highest US DB is Malaysia (0.68), followed by Thailand (0.56) and Singapore (0.37).

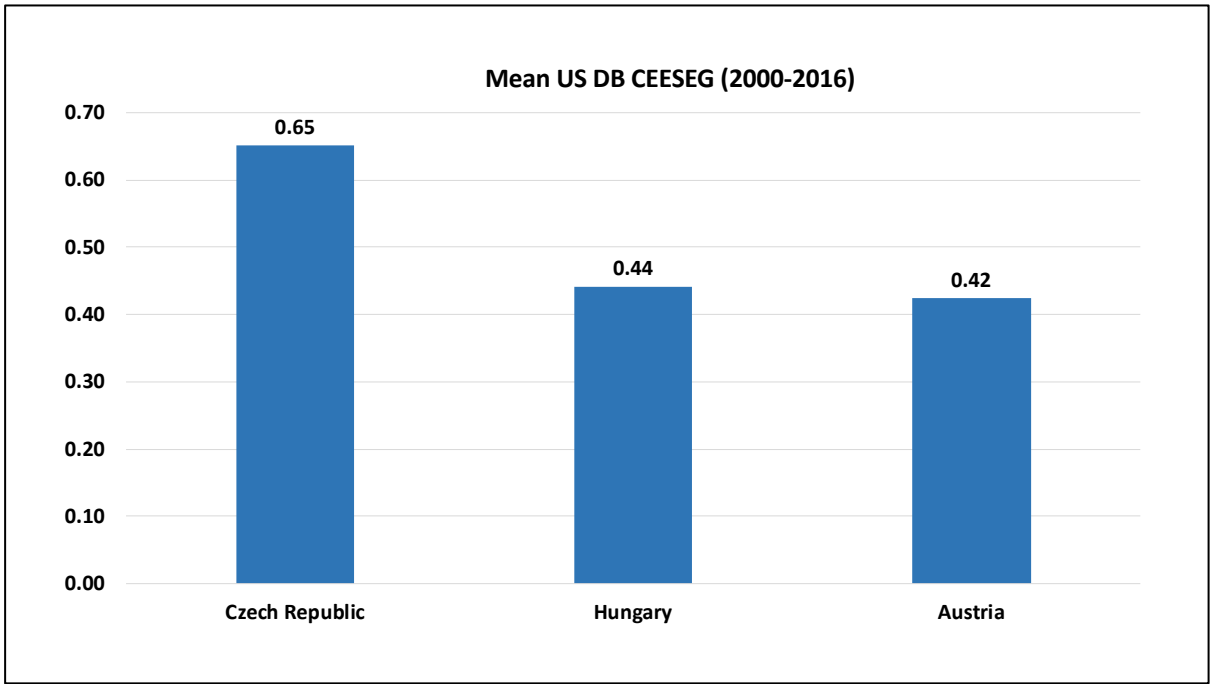
Figure 5.3 Mean US DB for ATL (2000-2016)



Note: Figure 5.3 shows the mean US DB of the stock market under ATL during the year 2000-2016. The stock market that has the highest US DB is Malaysia (0.68), followed by Thailand (0.56) and Singapore (0.37).

Figure 5.4 shows the mean US DB of the stock market under CEESEG during the year 2000-2016. The stock market that has the highest US DB is the Czech Republic (0.65) followed by Hungary (0.44) and Austria (0.42).

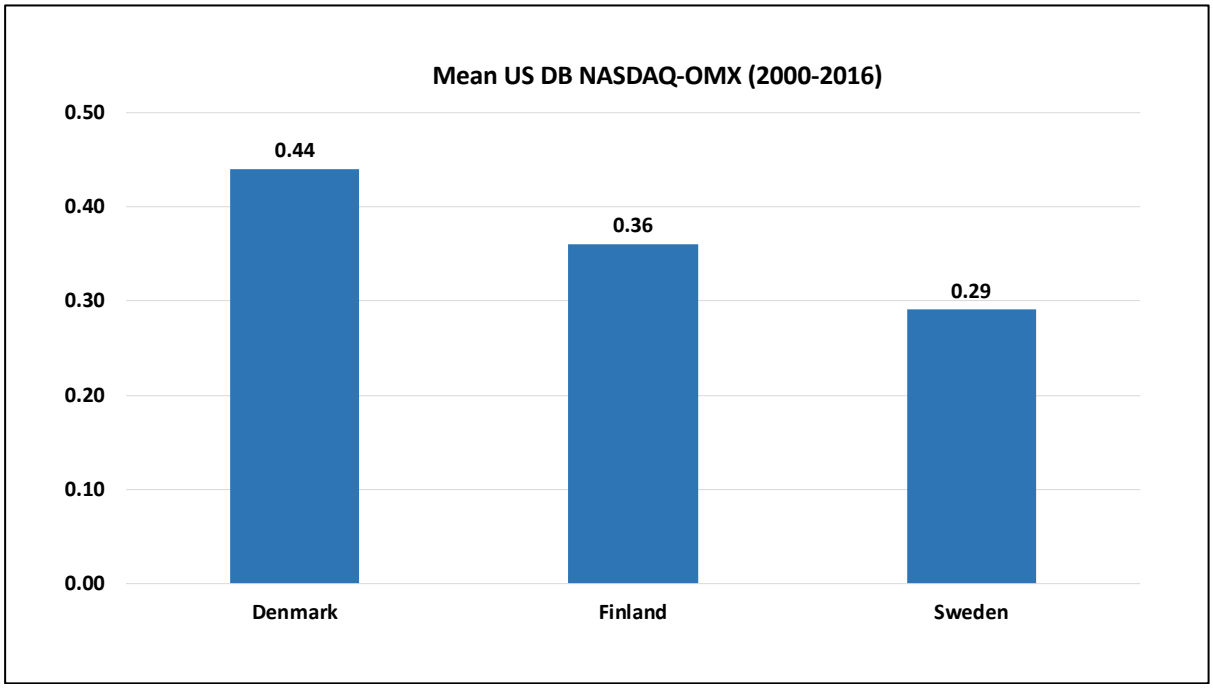
Figure 5.4 Mean US DB for CEESEG (2000-2016)



Note: Figure 5.4 shows the mean US DB of the stock market under CEESEG during the year 2000-2016. The stock market that has the highest US DB is the Czech Republic (0.65) followed by Hungary (0.44) and Austria (0.42).

Figure 5.5 shows the mean US DB of the stock market under NASDAQ-OMX during the year 2000-2016. The stock market that has the highest US DB is Denmark (0.44), followed by Finland (0.36) and Sweden (0.29).

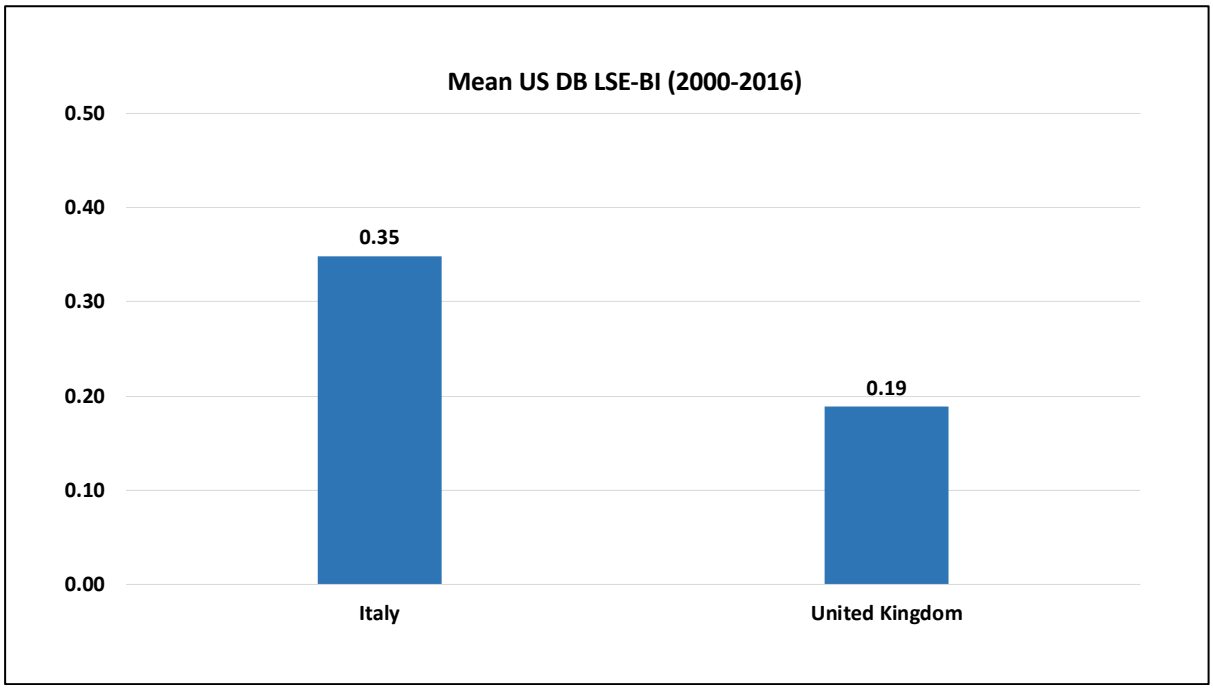
Figure 5.5 Mean US DB for NASDAQ-OMX (2000-2016)



Note: Figure 5.5 shows the mean US DB of the stock market under NASDAQ-OMX during the year 2000-2016. The stock market that has the highest US DB is Denmark (0.44), followed by Finland (0.36) and Sweden (0.29).

Figure 5.6 shows the mean US DB of the stock market under LSE-BI during the year 2000-2016. The stock market that has the highest US DB is Italy (0.35) followed by UK (0.19).

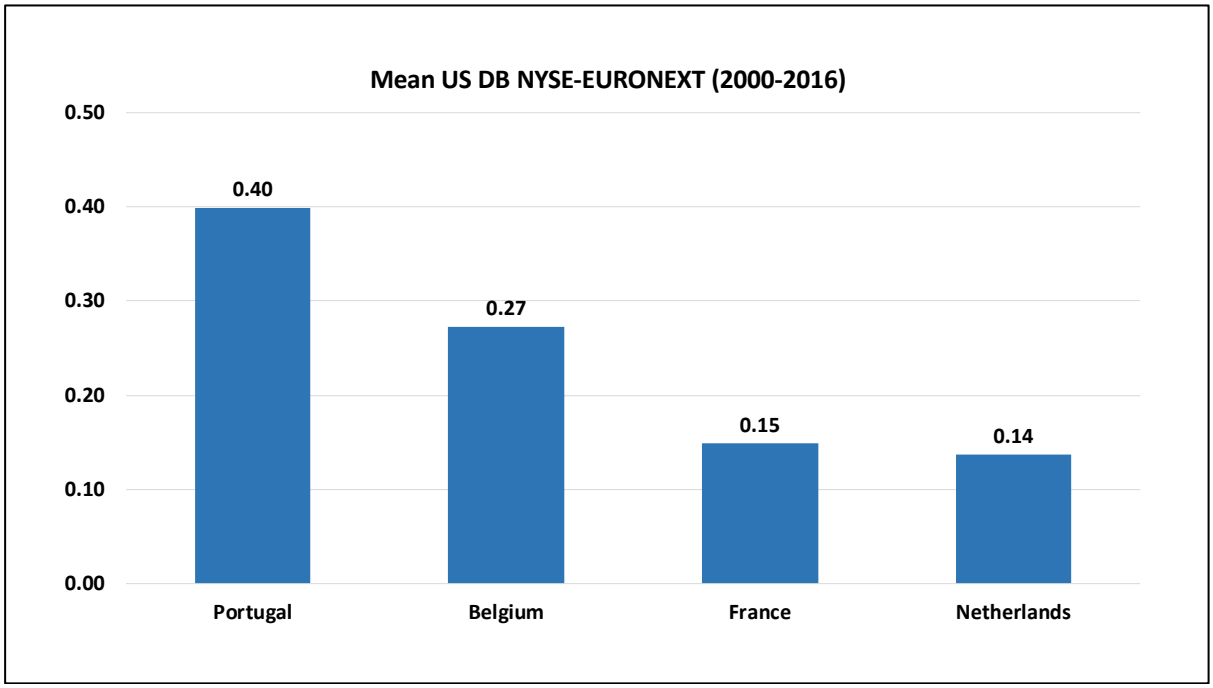
Figure 5.6 Mean US DB for LSE-BI (2000-2016)



Note: Figure 5.6 shows the mean US DB of the stock market under LSE-BI during the year 2000-2016. The stock market that has the highest US DB is Italy (0.35) followed by UK (0.19).

Figure 5.7 shows the mean US DB of the stock market under NYSE-EURONEXT during the year 2000-2016. The stock market that has the highest US DB is Portugal (0.40), followed by Belgium (0.27), France (0.15) and Netherland (0.14).

Figure 5.7 Mean US DB for NYSE-EURONEXT (2000-2016)

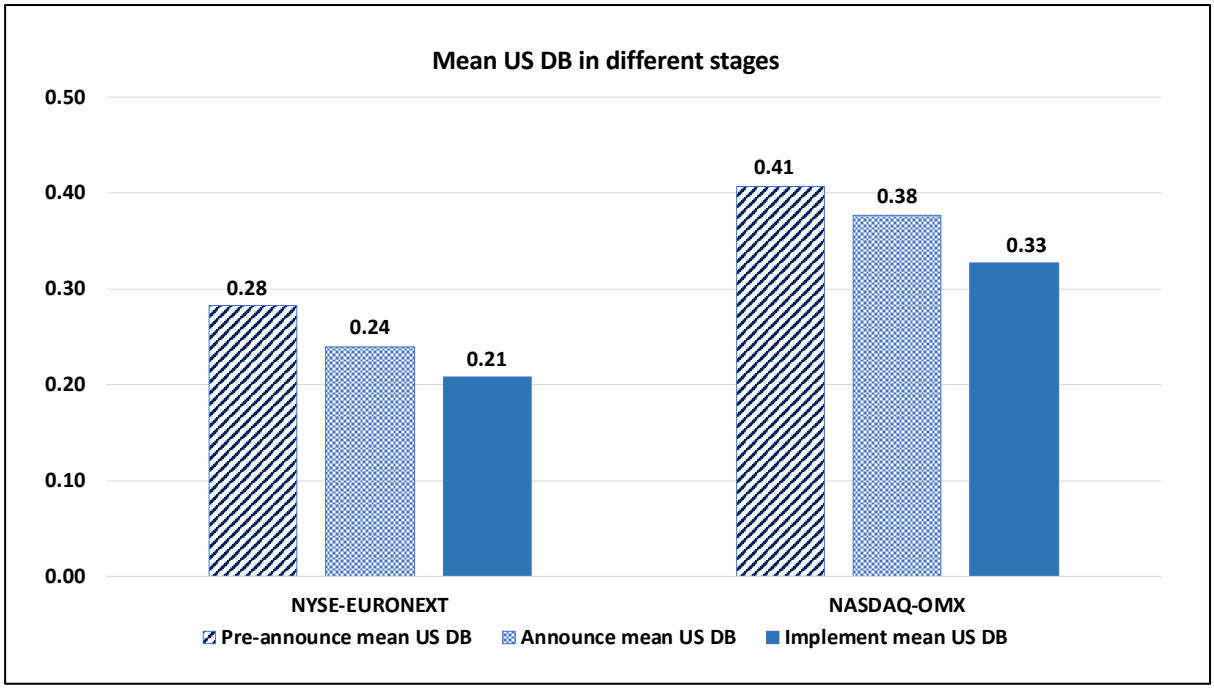


Note: Figure 5.7 shows the mean US DB of the stock market under NYSE-EURONEXT during the year 2000-2016. The stock market that has the highest US DB is Portugal (0.40), followed by Belgium (0.27), France (0.15) and Netherland (0.14).

5.4.2 Mean US DB in different stages

We compare the mean US DB in the pre-announce, ANNOUNCE and IMPLEMENT stages for the stock market consolidation groups including US stock markets and the groups that exclude the US stock markets. For the groups that include the US stock market, **Figure 5.8** shows that mean US DB decreased for the ANNOUNCE and IMPLEMENT comparing to the pre-announce stage for both NYSE-EURONEXT and NASDAQ-OMX group.

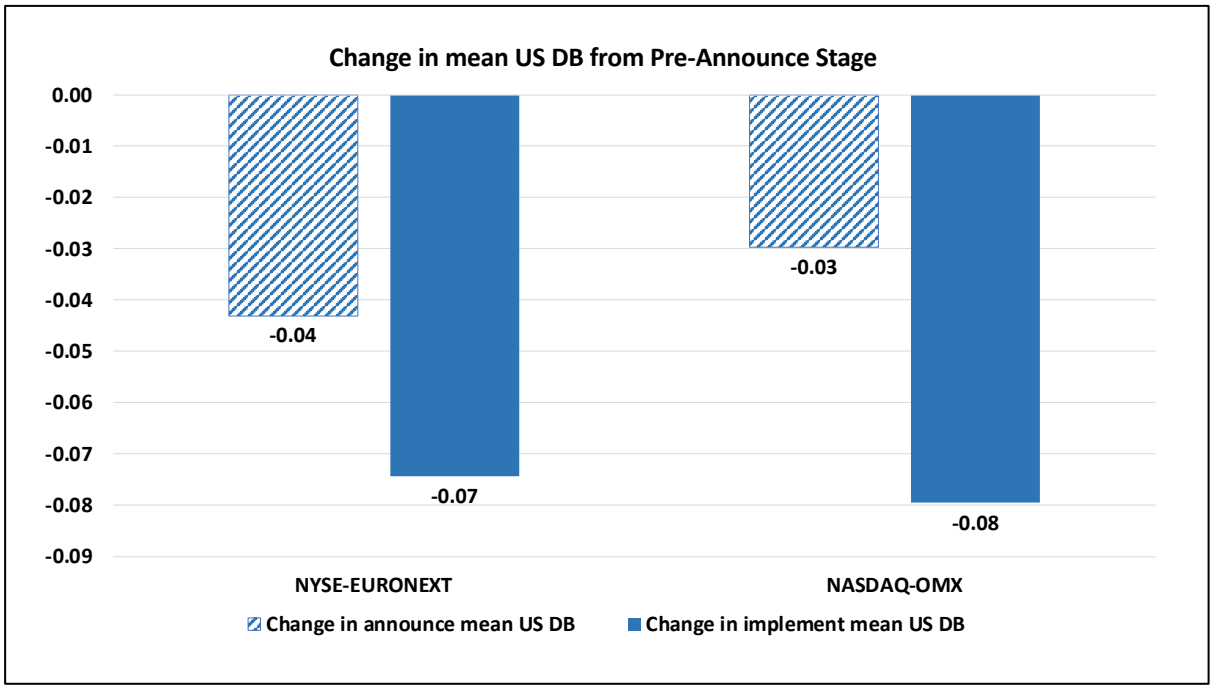
Figure 5.8 Mean US DB for stock market consolidation groups including US stock markets in different stages



Note: For the groups that include the US stock market, Figure 5.8 shows that mean US DB decreased for the ANNOUNCE and IMPLEMENT comparing to the pre-announce stage for both NYSE-EURONEXT and NASDAQ-OMX group.

To make it easier to understand, we compare the change in mean US DB of ANNOUNCE and IMPLEMENT stages from the pre-announce stage for the two groups. According to **Figure 5.9,** for announce stage, NYSE-EURONEXT has a higher decrease (-0.04) than the NASDAQ-OMX (-0.03). For implement stage, NASDAQ-OMX has a higher decrease (-0.08) than the NYSE-EURONEXT (-0.07).

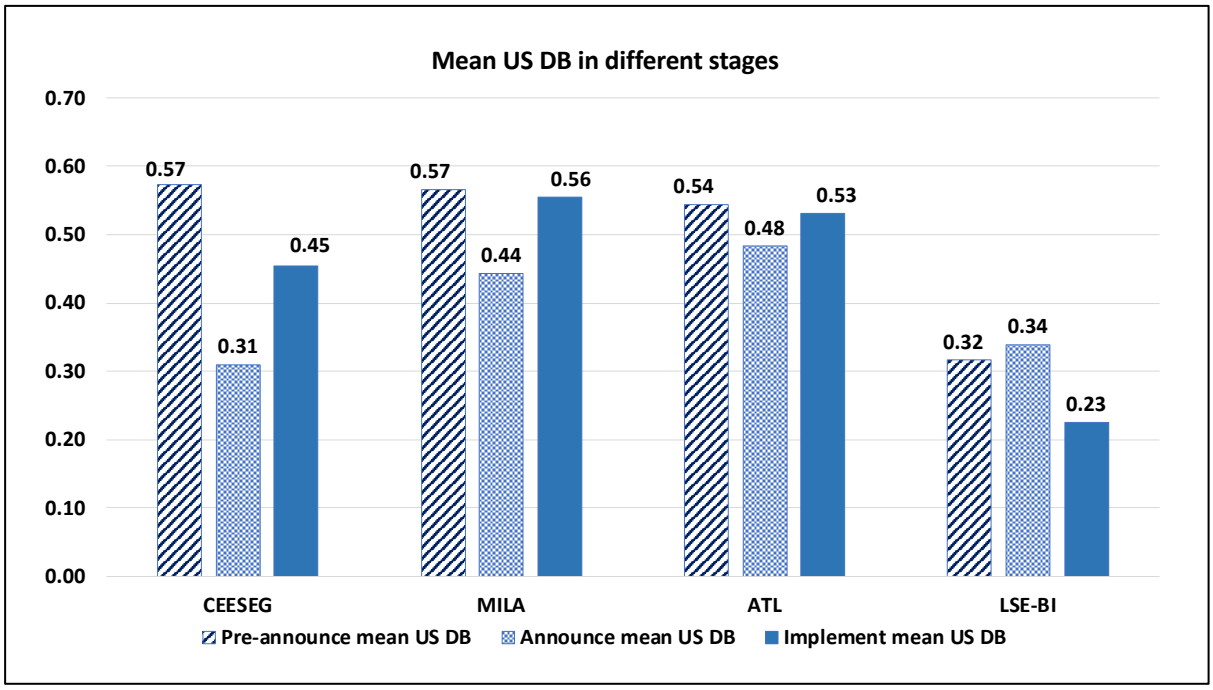
Figure 5.9 Change in mean US DB from pre-announce stage



Note: According to Figure 5.9, for announce stage, NYSE-EURONEXT has a higher decrease (-0.04) than the NASDAQ-OMX (-0.03). For implement stage, NASDAQ-OMX has a higher decrease (-0.08) than the NYSE-EURONEXT (-0.07).

For the groups that exclude the US stock market, **Figure 5.10** shows that mean US DB decreased for the ANNOUNCE and IMPLEMENT comparing to the pre-announce stage for CEESEG, MILA and ATL group. However, the ANNOUNCE stage for LSE-BI increase a bit before it decreases in the IMPLEMENT stage.

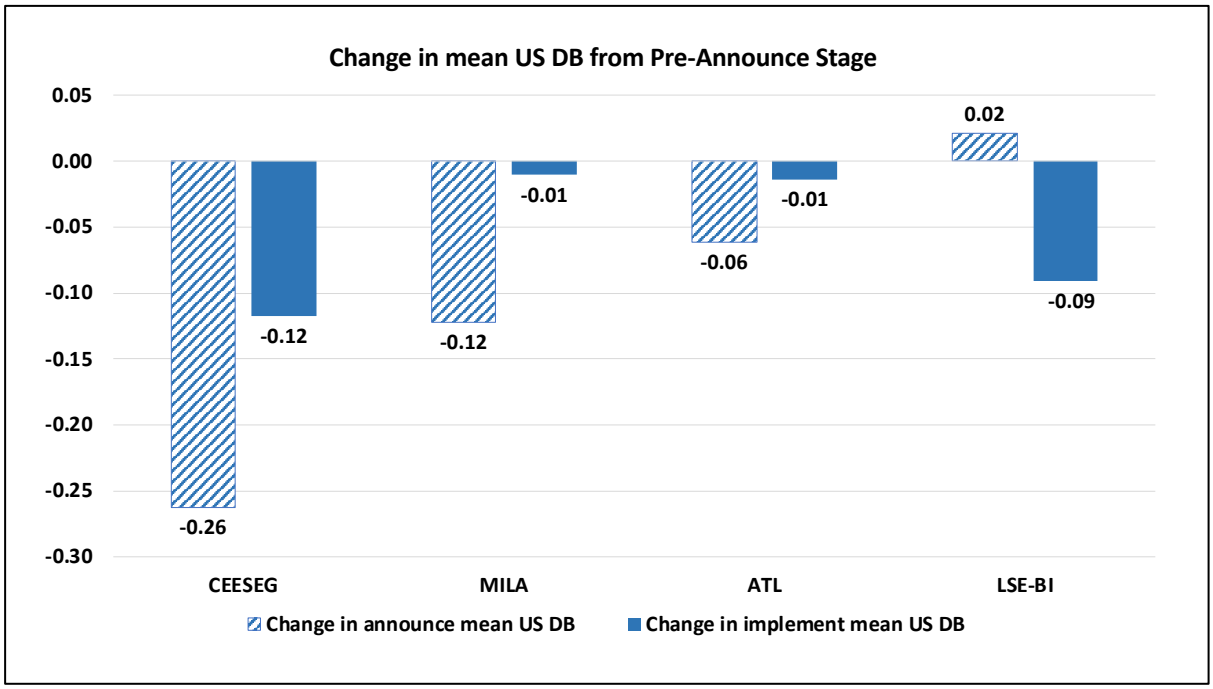
Figure 5.10 Mean US DB for stock market consolidation groups excluding US stock markets in different stages



Note: For the groups that exclude the US stock market, Figure 5.10 shows that mean US DB decreased for the ANNOUNCE and IMPLEMENT comparing to the pre-announce stage for CEESEG, MILA and ATL group. However, the ANNOUNCE stage for LSE-BI increase a bit before it decreases in the IMPLEMENT stage.

To make it easier to understand, we compare the change in mean US DB of ANNOUNCE and IMPLEMENT stages from the pre-announce stage for all the four groups. According to **Figure 5.11,** for announce stage, CEESEG has the highest decrease (-0.26) followed by MILA (-0.12), ATL (-0.06) and LSE-BI (0.02). For implement stage, CEESEG has the highest decrease (-0.12) followed by LSE-BI (-0.09), ATL (-0.01) and MILA (-0.01).

Figure 5.11 Change in mean US DB from pre-announce stage



Note: According to Figure 5.11, for announce stage, CEESEG has the highest decrease (-0.26) followed by MILA (-0.12), ATL (-0.06) and LSE-BI (0.02). For implement stage, CEESEG has the highest decrease (-0.12) followed by LSE-BI (-0.09), ATL (-0.01) and MILA (-0.01).

5.4.3 Factors affecting US DB

From the previous section, we can see that the mean US DB for most consolidation groups decreased during the announcement and implement stages. However, this could be due to other factors, so we conduct the OLS fixed effect panel regression to see the effect of stock market consolidation on US DB controlling for other factors such as financial crisis, market anomalies, exchange rate risk, stock market performance, real convergence and monetary policy convergence. We first conduct the OLS fixed effect panel regression for the consolidation group that includes US stock markets (NYSE-EURONEXT and NASDAQ-OMX) and the consolidation group that exclude the US stock markets (LSE-BI, CEESEG, MILA and ATL).

We analyze separately the effect of the ANNOUNCE and the IMPLEMENT stages on US DB. We use a standard correlation of 36 months rolling window (SC) and DCC-MGARCH model (DCC) as measures of US DB for the result shown in Model (1) DB_SC and Model (2) DB_DCC respectively. **Table 5.12** shows the OLS fixed effect panel regression result for NYSE-EURONEXT consolidation group.

For Model (1), the result shows that ANNOUNCE statistically significantly decreases US DB by -0.068 while IMPLEMENT does not have a significant effect on US DB. For the control variable, the variable that has the highest positive and significant impact on US DB is REALRATE (2.197) followed by VOL (1.393), and MD (0.048). Furthermore, the variable that has the highest negative and significant impact on US DB is DY (-3.967) followed by EXVOL (-1.918) and CRISISEU (-0.122). However, CRISISUS, JAN, GROWTH, TRADE, TERM and IFL do not have a significant effect on US DB. The R-square for model (1) is 0.42.

For model (2), the result shows that ANNOUNCE statistically significantly decreases US DB by -0.056 while IMPLEMENT does not have a significant effect on US DB. For the control variable, the variable that has the highest positive and significant impact on US DB is REALRATE (2.909) followed by VOL (1.585), TERM (0.939) and MD (0.042). Furthermore, the variable that has the highest negative and significant impact on US DB is DY (-4.066) followed by EXVOL (-2.286), CRISISEU (-0.046) and CRISISUS (-0.045).

However, JAN, GROWTH, TRADE and IFL do not have a significant effect on US DB. The R-square for model (2) is 0.36.

The result for the stock market consolidation effect on US DB are robust across the two models where the ANNOUNCE statistically significantly decreases US DB while IMPLEMENT does not have a significant effect on US DB. For other control variables, the results are robust for CRISISEU, EXVOL, MD, DY, VOL, and REALRATE where the variables are statistically significant. In addition, the result for JAN, GROWTH TRADE and IFL are also robust where the variables are not statistically significant. On the other hand, the result for CRISISUS and TERM are significant in model (2) but not in model (1).

Table 5.12 Fixed effect OLS panel regressions include US markets: NYSE-EURONEXT

Dependent Variable =	Model (1) DB_SC	Model (2) DB_DCC
ANNOUNCE	-0.068***	-0.056***
	(-0.02)	(-0.01)
IMPLEMENT	0.017	0.023
	(-0.02)	(-0.02)
CRISISUS	-0.032	-0.045**
	(-0.02)	(-0.01)
CRISISEU	-0.122***	-0.046***
	(-0.01)	(-0.01)
JAN	-0.008	-0.003
	(-0.01)	(-0.01)
EXVOL	-1.918*	-2.286***
	(-0.78)	(-0.59)
MD	0.048***	0.042***
	(-0.01)	(-0.01)
DY	-3.967***	-4.066***
	(-0.52)	(-0.39)
VOL	1.393**	1.585***
	(-0.45)	(-0.34)
GROWTH	-0.423	-0.255
	(-0.22)	(-0.16)
TRADE	-0.07	-0.016
	(-0.07)	(-0.05)
TERM	0.298	0.939***
	(-0.31)	(-0.24)
IFL	-2.48	0.999
	(-1.91)	(-1.45)
REALRATE	2.197**	2.909***
	(-0.69)	(-0.52)
CONSTANT	0.795***	0.547***
	(-0.10)	(-0.09)
Obs	816	816
R-Square	0.42	0.36
Time FE	Yes	Yes
Country FE	Yes	Yes

Note: The dependent variable is the Diversification Benefit (*DB*) calculated from USD return. *ANNOUNCE* is dummy for stock market consolidation announcement period. *IMPLEMENT* is the dummy for stock market consolidation implement period. Next, *CRISISUS* is the dummy for the global financial crisis started in the US. *CRISISEU* is the dummy for the European debt crisis. *JAN* is the January effect dummy. *EXVOL* is exchange rate volatility. *MD* is the stock market development. *DY* is the dividend yield. *VOL* is the dynamic standard deviation of return. *GROWTH* is the economic growth. *TRADE* is the trade openness. *TERM* is the term structure interest rate. *IFL* is the inflation rate. *REALRATE* is the real interest rate. Robust standard errors are shown in parentheses. For interpretation, the statistical significance is reported against 10% (*), 5% (**) and 1% (***) significance level.

Table 5.13 shows the OLS fixed effect panel regression result for NASDAQ-OMX consolidation group. For Model (1), the result shows that ANNOUNCE and IMPLEMENT statistically significantly decreases US DB by -0.088 and -0.199 respectively. For the control variable, the variable that has the highest positive and significant impact on US DB is TERM (1.873) followed by VOL (1.324), GROWTH (0.376), CRISISUS (0.103) and MD (0.020). Furthermore, the variable that has the highest negative and significant impact on US DB is EXVOL (-2.177) followed by DY (-1.758) and CRISISEU (-0.035). However, JAN, TRADE, IFL and REALRATE do not have a significant effect on US DB. The R-square for model (1) is 0.45.

For model (2), the result shows that ANNOUNCE does not have a statistically significant impact on US DB while IMPLEMENT statistically significantly decreases US DB by -0.037. For the control variable, the variable that has the highest positive and significant impact on US DB is TERM (1.210) followed by MD (0.014). Furthermore, the variable that has the highest negative and significant impact on US DB is EXVOL (-2.623) followed by REALRATE (-1.623). However, CRISISUS, CRISISEU, JAN, DY, VOL, GROWTH, TRADE and IFL do not have a significant effect on US DB. The R-square for model (2) is 0.45.

The result for IMPLEMENT is robust across the two models where the variable is negative and significant. However, ANNOUCE is negative and statistically significant for model (1) but insignificant for model (2). For other control variables, the results are robust for EXVOL, MD and TERM where the variables are statistically significant. In addition, the result for JAN, TRADE and IFL are also robust where the variables are not statistically significant. On the other hand, the result for CRISISUS, CRISISEU, DY, VOL and GROWTH is statistically significant in model (1) but not in model (2) while REALRATE is significant in model (2) but not in model (1).

Table 5.13 Fixed effect OLS panel regressions include US markets: NASDAQ-OMX

Dependent Variable =	Model (1) DB_SC	Model (2) DB_DCC
ANNOUNCE	-0.088***	-0.012
	(-0.02)	(-0.01)
IMPLEMENT	-0.199***	-0.037**
	(-0.02)	(-0.01)
CRISISUS	0.103***	-0.015
	(-0.02)	(-0.01)
CRISISEU	-0.035**	-0.001
	(-0.01)	(-0.01)
JAN	-0.009	-0.002
	(-0.01)	(-0.01)
EXVOL	-2.177**	-2.623***
	(-0.68)	(-0.45)
MD	0.020**	0.014**
	(-0.01)	(0.00)
DY	-1.758**	-0.214
	(-0.53)	(-0.35)
VOL	1.324***	0.173
	(-0.22)	(-0.15)
GROWTH	0.376**	0.150
	(-0.14)	(-0.09)
TRADE	0.126	0.003
	(-0.12)	(-0.08)
TERM	1.873*	1.210*
	(-0.81)	(-0.54)
IFL	-2.52	-0.003
	(-1.59)	(-1.05)
REALRATE	-0.357	-1.623***
	(-0.63)	(-0.42)
CONSTANT	-0.375***	0.662***
	(-0.10)	(-0.07)
Obs	612	612
R-Square	0.45	0.45
Time Fixed Effect	Yes	Yes
Country FE	Yes	Yes

Note: The dependent variable is the Diversification Benefit (*DB*) calculated from USD return. *ANNOUNCE* is dummy for stock market consolidation announcement period. *IMPLEMENT* is the dummy for stock market consolidation implement period. Next, *CRISISUS* is the dummy for the global financial crisis started in the US. *CRISISEU* is the dummy for the European debt crisis. *JAN* is the January effect dummy. *EXVOL* is exchange rate volatility. *MD* is the stock market development. *DY* is the dividend yield. *VOL* is the dynamic standard deviation of return. *GROWTH* is the economic growth. *TRADE* is the trade openness. *TERM* is the term structure interest rate. *IFL* is the inflation rate. *REALRATE* is the real interest rate. Robust standard errors are shown in parentheses. For interpretation, the statistical significance is reported against 10% (*), 5% (**) and 1% (***) significance level.

Table 5.14 shows the OLS fixed effect panel regression result for the consolidation group excluding US stock markets. For Model (1), the result shows that ANNOUNCE statistically significantly decreases US DB by -0.086 while IMPLEMENT statistically significantly increases US DB by 0.037. For the control variable, the variable that has the highest positive and significant impact on US DB is TERM (3.710) followed by DY (1.253). Furthermore, the variable that has the highest negative and significant impact on US DB is REALRATE (-2.036) followed by EXVOL (-1.604), VOL (-0.901), CRISISEU (-0.197) and CRISISUS (-0.035). However, JAN, MD, GROWTH, TRADE and IFL do not have a significant effect on US DB. The R-square for model (1) is 0.32.

For model (2), the result shows that IMPLEMENT increases US DB by 0.059 unit and is statistically significant at 1% level. The result shows that ANNOUNCE decreases US DB by -0.002 unit but not statistically significant. IMPLEMENT increases US DB by 0.058 and is statistically significant at 1% level. For the control variable, the variable that has the highest positive and significant impact on US DB is TERM (3.973) followed by DY (2.581). Furthermore, the variable that has the highest negative and significant impact on US DB is REALRATE (-1.797) followed by EXVOL (-1.150), VOL (-0.460), GROWTH (-0.296), CRISISEU (-0.074). However, CRISISUS, JAN, MD, TRADE and IFL do not have a significant effect on US DB. The R-square for model (2) is 0.19.

The result for IMPLEMENT is robust across the two models where the variable is positive and significant. However, ANNOUCE is negative and statistically significant for model (1) but insignificant for model (2). For other control variables, the results are robust for CRISISEU, EXVOL, DY, VOL TERM and REALRATE where the variables are statistically significant. In addition, the result for JAN, MD, TRADE and IFL are also robust where the variables are not statistically significant. On the other hand, the result for CRISISUS is significant in model (1) but not in model (2) while GROWTH is significant in model (2) but not in model (1).

Table 5.14 Fixed effect OLS panel regressions exclude US markets

Dependent Variable =	Model (1) DB_SC	Model (2) DB_DCC
ANNOUNCE	-0.086***	-0.002
	(-0.02)	(-0.02)
IMPLEMENT	0.037**	0.058***
	(-0.01)	(-0.01)
CRISISUS	-0.035**	-0.018
	(-0.01)	(-0.01)
CRISISEU	-0.197***	-0.074***
	(-0.01)	(-0.01)
JAN	-0.004	-0.011
	(-0.01)	(-0.01)
EXVOL	-1.604***	-1.150**
	(-0.38)	(-0.39)
MD	0.007	0.016
	(-0.01)	(-0.01)
DY	1.253***	2.581***
	(-0.29)	(-0.30)
VOL	-0.901***	-0.460*
	(-0.18)	(-0.18)
GROWTH	0.03	-0.296*
	(-0.13)	(-0.13)
TRADE	0.097	-0.025
	(-0.05)	(-0.05)
TERM	3.710***	3.973***
	(-0.33)	(-0.33)
IFL	0.234	-2.123
	(-1.28)	(-1.30)
REALRATE	-2.036***	-1.797***
	(-0.21)	(-0.21)
CONSTANT	0.909***	0.886***
	(-0.06)	(-0.06)
Obs	2,244	2,244
R-Square	0.32	0.19
Time Fixed Effect	Yes	Yes
Group Fixed Effect	Yes	Yes

Note: The dependent variable is the Diversification Benefit (*DB*) calculated from USD return. *ANNOUNCE* is dummy for stock market consolidation announcement period. *IMPLEMENT* is the dummy for stock market consolidation implement period. Next, *CRISISUS* is the dummy for the global financial crisis started in the US. *CRISISEU* is the dummy for the European debt crisis. *JAN* is the January effect dummy. *EXVOL* is exchange rate volatility. *MD* is the stock market development. *DY* is the dividend yield. *VOL* is the dynamic standard deviation of return. *GROWTH* is the economic growth. *TRADE* is the trade openness. *TERM* is the term structure interest rate. *IFL* is the inflation rate. *REALRATE* is the real interest rate. Robust standard errors are shown in parentheses. For interpretation, the statistical significance is reported against 10% (*), 5% (**) and 1% (***) significance level.

5.5 Discussion

5.5.1 Comparison of US DB

Consistent with the hypothesis, the stock market consolidation groups that contain emerging market country stock markets (ATL, CEESEG, MILA) seems to have a higher mean US DB comparing to those groups that contain developed country stock markets (LSE-BI, NYSE-EURONEXT, NASDAQ-OMX). In addition, the mean US DB for the consolidation groups that exclude US stock markets (ATL, CEESEG, MILA, LSE-BI) are higher than those of the group that include the US stock markets (NYSE-EURONEXT, NASDAQ-OMX).

This result is consistent when we look at the mean US DB for each stock market within the consolidation group that contain both developed and EM stock markets which are ATL and CEESEG. For ATL, the mean US DB for Malaysia and Thailand which are EM countries is higher than Singapore which is a developed country. For CEESEG, the mean US DB for the Czech Republic which is EM country is higher than Hungary and Austria which are developed countries.

This result is consistent with the previous literature where the degree of stock market return correlation for the developed countries tend to be higher than in the emerging market countries (Kim et al. 2006; Hwang 2012; Boubakri and Guillaumin 2011; Guesmi and Nguyen 2014; Guesmi et al. 2014).

5.5.2 Mean US DB in different stages

Consistent with the hypothesis, for the consolidation groups that include US stock markets, we found that the mean US DB decreases after ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage. This decrease is the effect of the increase in the stock market return correlation during this time. We also found that the mean US DB experience higher decrease during IMPLEMENT comparing to ANNOUNCE stage as it is the stage where stock markets under the consolidation groups is allowed to trade under the common trading platform.

Consistent with previous studies, there is evidence of an increase in stock market return correlation for the European Union (EU) countries during similar events of the formation of a political and economic union such as EU (Buttner and Hayo 2011; Kim et al. 2006; Dimitriou and Simos 2013).

For consolidation groups that exclude US stock markets, the mean US DB decreases for both ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage for most of the groups. The reason behind is that the bigger consolidated markets make these stock markets more attractive to invest in and the stock market return correlation between US and these markets might increase. However, the mean US HB for LSE-BI experience slight increase in the ANNOUNCE stage before it decreases in the IMPLEMENT stage as the US stock markets might become more integrated with its own group but less integrated with other groups.

5.5.3 Factors affecting US DB

For the consolidation group that include US stock markets, we found that there is a negative and statistically significant effect of ANNOUNCE on US DB for NYSE-EURONEXT and negative and significant effect of IMPLEMENT on US DB for NASDAQ-OMX. This result is consistent with the hypothesis where ANNOUNCE and IMPLEMENT variable are expected to have a negative effect on US DB as the stock market return correlation should increase during this period.

The reason that only ANNOUNCE is significant for NYSE- EURONEXT while only IMPLEMENT is significant for NASDAQ-OMX is that NASDAQ operates as a dealer network where securities are traded on a computerized, speedy and transparent system. Stocks listed under NASDAQ composite are the world's foremost technology such as Apple, Google, Microsoft, Oracle, Amazon, and Intel. On the other hand, NYSE operates through stock brokers and the stocks listed under NYSE are not concentrated in specific industries as NASDAQ.

According to the Efficient Market Hypothesis (EMH), share prices reflect all information and it is impossible for investors to purchase undervalued stocks or sell stocks for inflated prices. Due to the trading system of the market, NASDAQ is expected to be more market efficient than NYSE. Therefore, it is more difficult to speculate on stock prices in the NASDAQ comparing to the NYSE stock market which coincides with our result that ANNOUNCE is only significant for NYSE and IMPLEMENT is only significant for NASDAQ.

For the groups that exclude US stock markets, even though the result is negative in the ANNOUNCE period, it is not statistically significant but there is a positive and significant effect of IMPLEMENT on US DB. Consistent with other studies, this result implies that US stock markets become more integrated with its own group but less integrated with other groups after the stock market consolidation (Buttner and Hayo 2011; Dimitrios and Simos 2011).

Since this study is the first to look at the effect of stock market consolidation on DB, we have to compare our results to the literature that examines similar events. Consistent with

previous studies, similar events of the formation of a political and economic union such as European Union (EU) has a positive and statistically significant effect on stock market return correlation of the EU countries (Buttner and Hayo 2011; Kim et al. 2006; Dimitriou and Simos 2013).

Second, we found that there is a negative and statistically significant effect of CRISISUS and CRISISEU on US DB for NYSE-EURONEXT and consolidation groups that exclude US stock markets which is consistent with the hypothesis since the stock markets are affected in the same direction. Our results are consistent with many previous studies which also found that MI increased during the financial crisis period (Erb et al. 1994; Longin and Solnik 2001; Lim 2009; Boubakri and Guillaumin 2011; Karim and Karim 2012; Arouri et al. 2012).

Third, there is a positive and statistically significant effect of REALRATE, VOL, TERM, MD and DY which is consistent with the hypothesis since the higher the difference reflects the deviation in the stage of economy. Our results are consistent with many previous studies which also found that these variables have a statistically significant impact on return correlation.

Consistent with our result, Bracker and Koch (1999) found that REALRATE has a significant effect on return correlation while the other studies found it to be insignificant (Pretorius 2002; Kim et al. 2006; Buttner and Hayo 2011; Boubakri and Guillaumin 2011). Bracker and Koch (1999) and Valdes et al. (2016) found that VOL is a significant factor while Pretorius (2002) did not find that VOL is a significant factor that affects return correlation. Similar to our study, many previous studies also found that TERM is a significant factor that affects return correlation (Bracker and Koch 1999; Kim et al. 2006; Guesmi et al. 2014; Guesmi and Nguyen 2014). Similar to our study, many studies also found that MD is a significant factor that affects return correlation (Guesmi et al. 2006; Buttner and Hayo 2011; Guesmi and Nguyen 2014; Valdes et al. 2016). Some studies found that DY is a significant factor that affect return correlation (Kim et al. 2006; Boubakri and Guillaumin 2011; Arouri et al. 2012) while the other study found it to be insignificant (Guesmi et al. 2006; Guesmi et al. 2014; Guesmi and Nguyen 2014; Valdes et al. 2016).

Next, there is a negative and statistically significant effect of EXVOL and GROWTH on US DB which is inconsistent with the hypothesis. However, there is also a possibility that these

variables might have a positive effect on return correlation if the investors see that the difference in the stage of the economy reflect the diversification opportunity and invest in both countries to gain diversification benefit.

Consistent with our result, many previous studies also found that EXVOL is a significant factor that affects return correlation (Bracker and Koch 1999; Guesmi et al. 2006; Kim et al. 2006; Guesmi et al. 2014; Valdes et al. 2016; Arouri et al. 2012). However, Buttner and Hayo (2011) Guesmi and Nguyen (2014) did not find that it is a significant factor. Pretorius (2002) and Kim et al. (2006) found that GROWTH is a significant factor that affects return correlation while others found it to be insignificant (Bracker and Koch 1999; Guesmi et al. 2006; Guesmi et al. 2014; Guesmi and Nguyen 2014).

Finally, we found that JAN, TRADE and IFL do not have a statistically significant effect on US DB. Kim et al. (2006) did not find that JAN is a significant factor that affects return correlation which is similar to our study. Consistent with our study, Bracker and Koch (1999) and Guesmi et al. (2014) did not find that TRADE is a significant factor that affects return correlation. However, other studies found it to be a significant factor (Pretorius 2002; Guesmi et al. 2006; Kim et al. 2006; Guesmi and Nguyen 2014; Valdes et al. 2016). Consistent with our result, Bracker and Koch (1999), Pretorius (2002), Kim et al. (2006) and Mukherjee (2007) did not find that IFL is a significant factor that affects return correlation while other studies found it to be significant (Guesmi et al. 2006; Guesmi et al. 2014; Guesmi and Nguyen 2014; Valdes et al. 2016; Boubakri and Guillaumin 2011).

5.6 Conclusion

Due to the recent trends of stock market consolidations around the world, we are interested in investigating whether this event has a significant effect on US DB. While the degree of DB has been widely studied, none of the previous studies have examined the determinants of DB especially the effect of the stock market consolidation on US DB. We decompose stages of stock market consolidation into ANNOUNCE and IMPLEMENT period to distinguish the effect from each period. The first objective is to compare US DB between six stock market consolidation groups. The second objective is to compare mean US DB in different stages. Finally, the third objective is to examine the factors affecting US DB

especially the effect of ANNOUNCE and IMPLEMENT on US DB controlling for other control variables.

Following the first objective, we compare the mean US DB for six stock market consolidation groups in our sample during the year 2000-2016. Consistent with the hypothesis, we found that the stock market consolidation groups that contain emerging market country stock markets (ATL, CEESEG, MILA) seems to have a higher mean US DB comparing to those groups that contain developed country stock markets (LSE-BI, NYSE-EURONEXT, NASDAQ-OMX). In addition, the mean US DB for the consolidation groups that exclude US stock markets (ATL, CEESEG, MILA, LSE-BI) are higher than those of the group that include the US stock markets (NYSE-EURONEXT, NASDAQ-OMX).

To answer the second objective, we compare the mean US DB for six stock market consolidation groups in the pre-announce, ANNOUNCE and IMPLEMENT stages. For the consolidation group that include US stock markets, we found that mean US DB decreased for the ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage. We also found that the mean US DB experience higher decrease during IMPLEMENT comparing to ANNOUNCE stage as it is the stage where stock markets under the consolidation groups is allowed to trade under the common trading platform. For consolidation groups that exclude US stock markets, the mean US DB decreases for both ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage for most of the groups except LSE-BI that experience slight increase in the ANNOUNCE stage before it decreases in the IMPLEMENT stage.

According to the third objective, we examine the factors affecting US DB especially the effect of ANNOUNCE and IMPLEMENT on US DB controlling for other control variables. For the consolidation group that includes US stock markets, this result is consistent with the hypothesis where ANNOUNCE and IMPLEMENT variable are expected to have a negative effect on US DB. For the groups that exclude US stock markets, we found that there is a positive and significant effect of IMPLEMENT on US DB which is consistent with the hypothesis. This result implies that US stock markets become more integrated with its own group but less integrated with other groups.

For the other control variables, REALRATE, VOL, TERM, MD and DY have a positive and significant impact on US DB while CRISISUS, CRISISEU, EXVOL and GROWTH have a negative and significant impact on US DB. However, JAN, TRADE and IFL do not have a statistically significant effect on US DB.

Chapter 6: Stock Market Consolidation and equity Home bias

6.1 Introduction and literature review

The stock market consolidation plan is believed to decrease the degree of equity home bias (HB) as it is easier for investors to buy equity across country. From the policymaker perspective, lower HB means investors are willing to decrease their portfolio weight toward the domestic country and increase diversification opportunity abroad. Therefore, it is important to achieve a better understanding of how the stock market consolidation event affect the degree of HB.

The objectives of this chapter are to compare US HB between six stock market consolidation groups, compare mean US HB in different stages and examine the factors affecting US HB especially the effect of different stages of the stock market consolidation on US HB controlling for numerous economic and stock market characteristics.

In this study, we will use the ICAPM optimal portfolio weight to investigate the US HB toward 22 destination countries around the world that experienced stock market consolidation during the year 2001-2016. Float-adjusted ICAPM HB will be used as a robust measure of HB. US investor is chosen because the US is part of two stock exchange consolidations during that period. Thus, choosing the US as a home country can distinguish between the effect of the attractiveness of the destination countries consolidation group and the ease of being under the same stock market consolidation group.

Early studies have observed the Home bias puzzle or the phenomenon where the domestic investors tend to outweigh domestic investment comparing to foreign investment (French and Poterba 1991; Cooper and Kaplanis 1994; Bekaert and Harvey 1995; Chan et al. 2005). Many studies tried to solve this puzzle by investigating the factors driving HB (Daly and Vo 2013; Mishra 2008; Mishra 2014; Dahlquist et al. 2003; Fidora et al. 2007; Chan et al. 2005; Ahearne et al. 2004). However, to the best of our knowledge, none of the previous literature has looked at the effect of the stock market consolidation on HB.

Previous literatures widely used International Capital Asset Pricing Model (ICAPM) to calculate optimal portfolio weight due to its simplicity in term of calculation and

interpretation (Baele et al. 2007a; Daly and Vo 2013; Dahlquist et al. 2003; Fidora et al. 2007; Chan et al. 2005; Ahearne et al. 2004). ICAPM assumes that the optimal weight of domestic investor's foreign securities holding equals to the weight of each country market capitalization in the world market capitalization. However, Mishra (2008) and Mishra (2014) argue that the ICAPM home bias measure should be adjusted by the number of float share available to trade in each country.

The rest of the chapter is organized as followed: 6.2 gives the data and variables including sample, variable description, expected sign and hypothesis and descriptive statistics. 6.3 shows the methodology including the conceptual and empirical model. 6.4 provides the result following the objectives of the study. 6.5 discusses the result and 6.6 concludes the key takeaway from the chapter.

6.2 Data and Variables

6.2.1 Sample

We estimated the bilateral US home bias with 22 destination countries. **Table D-2** in **Appendix D** lists these destination countries as well as the stock markets and the consolidation timeline. Our sample covers the 2001-2016 period so that we have the data for the pre-and the post-consolidation years for the six stock market consolidations. We use yearly data as the US holding of equity data is only available on an annual basis. There are three subsamples used in this study as we would like to distinguish the result of the consolidation groups that include the US stock market and the consolidation groups that exclude the US stock market.

For the consolidation groups that include the US stock market, the first sample is NYSE-EURONEXT group. We derive the sample using the step shown in **Table 6.1**. Starting with 64 observation from the chosen countries and sample period, we do not have any missing data, so the final sample consists of 64 country-year observations.

Table 6.1 NYSE-EURONEXT Sample Selection

Sample Selection 2000-2016	
	Observations
Chosen countries and sample period	64
Final Sample	64

Note: we derive the sample using the step shown in Table 6.1.

The final sample of stock market includes the Amsterdam Stock Exchange (Netherland), Brussels Stock Exchange (Belgium), Paris Stock Exchange (France) and Lisbon Stock Exchange (Portugal). In this sample, the stock market consolidation announcement and implement date is the date that these stock market consolidated with NYSE (USA). **Table 6.2** summarizes the final sample of stock markets under NYSE-EURONEXT and the stock markets consolidation announcement and implement date.

Table 6.2 NYSE-EURONEXT Announcement and Implement Date

Consolidation Group	Stock Market Index	Announcement	Implement
NYSE-EURONEXT	Amsterdam Stock Exchange (Netherland)	June 2006	April 2007
	Brussels Stock Exchange (Belgium)	June 2006	April 2007
	Paris Stock Exchange (France)	June 2006	April 2007
	Lisbon Stock Exchange (Portugal)	June 2006	April 2007

Note: Table 6.2 summarizes the final sample of stock markets under NYSE-EURONEXT and the stock markets consolidation announcement and implement date.

For the consolidation groups that include the US stock market, the second sample is NASDAQ-OMX group. We derive the sample using the step shown in **Table 6.3**. Starting with 80 observations from the chosen countries and sample period, we do not have any missing data, so the final sample consists of 80 country-year observations.

Table 6.3 NASDAQ-OMX Sample Selection

Sample Selection 2000-2016	
	Observations
Chosen countries and sample period	80
Final Sample	80

Note: We derive the sample using the step shown in Table 6.3.

The final sample of stock market includes Stockholm Stock Exchange (Sweden), Helsinki Stock Exchange (Finland), Estonia Stock Exchange (Estonia), Copenhagen Stock Exchange (Denmark) and Iceland Stock Exchange (Iceland). In this sample, the stock market consolidation announcement and implement date is the date that these stock market consolidated with NASDAQ (USA). **Table 6.4** summarizes the final sample of stock markets under NASDAQ-OMX and the stock markets consolidation announcement and implement date.

Table 6.4 NASDAQ-OMX Announcement and Implement Date

Consolidation Group	Stock Market Index	Announcement	Implement
NASDAQ- OMX	Stockholm Stock Exchange (Sweden)	May 2007	February 2008
	Helsinki Stock Exchange (Finland)	May 2007	February 2008
	Estonia Stock Exchange (Estonia)	May 2007	February 2008
	Copenhagen Stock Exchange (Denmark)	May 2007	February 2008
	Iceland Stock Exchange (Iceland)	May 2007	February 2008

Table 6.4 summarizes the final sample of stock markets under NASDAQ-OMX and the stock markets consolidation announcement and implement date.

For the consolidation groups that exclude the US stock market, the sample includes LSE-BI, MILA, CEESEG and ATL group. We derive the sample using the step shown in **Table 6.5**. Starting with 208 observation from the chosen countries and sample period, we do not have any missing data, so the final sample consists of 208 country-year observations.

Table 6.5 Sample Selection of consolidation groups that exclude US

Sample Selection 2000-2016	
	Observations
Chosen countries and sample period	208
Final Sample	208

Note: We derive the sample using the step shown in Table 6.5

The final sample of stock market includes London Stock Exchange (UK), Italian Stock Exchange (Italy), Budapest Stock Exchange (Hungary), Slovenia Stock Exchange (Slovenia), Prague Stock Exchange (Czech Republic), Vienna Stock Exchange (Austria), Lima Stock Exchange (Peru), Colombia Stock Exchange (Colombia), Chile Stock Exchange (Chile), Mexican Stock Exchange (Mexico), Bursa Malaysia (Malaysia), Singapore Exchange (Singapore), Stock Exchange of Thailand (Thailand). **Table 6.6** summarizes the final sample of stock markets for the consolidation groups that exclude the US stock market and the stock markets consolidation announcement and implement date.

Table 6.6 Announcement and Implement Date of consolidation groups that exclude US

Consolidation Group	Stock Market Index	Announcement	Implement
LSE-BI	London Stock Exchange (UK)	June 2007	October 2007
	Italian Stock Exchange (Italy)	June 2007	October 2007
CEESEG	Budapest Stock Exchange (Hungary)	November 2008	January 2010
	Ljubljana Stock Exchange (Slovenia)	November 2008	January 2010
	Prague Stock Exchange (Czech Republic)	November 2008	January 2010
	Vienna Stock Exchange (Austria)	November 2008	January 2010
MILA	Lima Stock Exchange (Peru)	September 2009	May 2011
	Colombia Stock Exchange (Colombia)	September 2009	May 2011
	Chile Stock Exchange (Chile)	September 2009	May 2011
	Mexican Stock Exchange (Mexico)	July 2014	December 2014
ATL	Bursa Malaysia (Malaysia)	April 2011	September 2012
	Singapore Exchange (Singapore)	April 2011	September 2012
	Stock Exchange of Thailand (Thailand)	April 2011	October 2012

Note: Table 6.6 summarizes the final sample of stock markets for the consolidation groups that exclude the US stock market and the stock markets consolidation announcement and implement date.

6.2.2 Variable Description

The dependent variable of US home bias (HB) is the degree of the US HB toward 22 destination countries under each stock market consolidation group calculated from the formula shown in the methodology part. The holding data is obtained from the IMF's Coordinated Portfolio Investment Survey (CPIS) while the market capitalization data is from the World Bank's World Development Indicator (WDI).

For the dummy consolidation variables which are the variables of interest in this study, we included the dummy for the stock market consolidation announcement period (ANNOUNCE) which equals to 1 from the announcement date to the implement date and 0 otherwise and the dummy for stock market consolidation implement period (IMPLEMENT) which equals to 1 from the implement date until the end of the sample and 0 otherwise to distinguish between the effect from the announcement of the deal and the implementation of the deal. This data is obtained from the stock market consolidation's website.

We included the dummy control variable for the global financial crisis started in the US (CRISISUS) which equals to 1 during the period 2007 - 2009 and 0 otherwise and the dummy for the European debt crisis (CRISISEU) which equals to 1 during the period 2009 - 2011 and 0 otherwise. The crisis period data are obtained from the International Monetary Fund (IMF)'s World Economic Outlook (WEO) crisis and recovery report.

We also control for the direct cost including the withholding tax (WT) of dividend in the destination countries. The withholding tax is different for each destination country where the country that sign a treaty with the US charge lower tax. The tax ranges from 0 to 30 percent. This data is obtained from the Ernst and Young worldwide corporate tax guide. The other direct cost is the capital account openness (CO) proxy by Chinn-Ito capital account openness. The index ranks the score of the capital account openness in each country from 0 meaning no capital account openness to 1 meaning full capital account openness using the information provided in the International Monetary Fund (IMF) Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). The data can be obtained from the Chinn-Ito index website.

In addition, the indirect cost includes bilateral trade (BILAT) proxy by bilateral import and export between US and destination country over US total import and export with all partner country. This data can be obtained from the United Nations website. Next, the usage of internet of the destination country (INT) calculated from the share of internet user in the destination country's population. The data is obtained from the world bank's world development indicator. The last indirect cost of home bias is the natural logarithm of the distance between the US capital city to the destination country's capital city (DIST). Many studies used this variable as a proxy for the information cost of cross-country equity investment. The data can be obtained from the chemical ecology website.

Furthermore, the Incentive of Investment variable includes the exchange rate volatility (EXVOL) calculated from the standard deviation of the previous year monthly exchange rate. Exchange rate is expressed in terms of each domestic currency per unit of USD. The exchange rate data can be obtained through Datastream. The other incentive of investment variable is the diversification opportunity of the destination country (DIVER) calculated from 1 minus the correlation between US and destination country monthly MSCI return in the previous year. The monthly return data is obtained from Datastream. Next, the historical risk-adjusted return of the destination countries (RAR) calculated from the historical average of monthly returns of the MCSI index over the standard deviation of returns in the previous year. The monthly return data is obtained from Datastream. The last incentive of investment variable is the equity market liquidity (ML) calculated from stock traded per GDP in the previous year. The data is obtained from the world bank's world development indicator.

To control for the size of the destination country, the first variable is market capitalization (MCAP) proxy by the destination country's market capitalization divided by the world market capitalization. Both of this data is available in the world bank's world development indicator website. The other variable growth proxy by the growth of the GDP per capita of the destination country. This data is obtained from Datastream.

Finally, to control for the governance of the destination country, I include the governance indicators (GOV) provided by the World Governance Indicators (WGI) normalized to between 0 and 1 with 1 meaning perfect governance and 0 meaning poor governance. All the variable definitions are summarized in **Table 6.7**.

Table 6.7 Variable Definitions

Category	Independent Variables	Measurement
Dependent Variable	HB	HB= US HB toward 22 destination countries
Dummy Consolidations	ANNOUNCE	Stock market consolidation announcement period (= 1 from the announcement date to the implement date and 0 otherwise)
	IMPLEMENT	Stock market consolidation implement period (= 1 from the implement date onward and 0 otherwise)
Financial Crises	CRISISUS	US global financial crisis (= 1 during the period 2007 to 2009 and 0 otherwise)
	CRISISEU	European debt crisis (= 1 during the period 2009 to 2011 and 0 otherwise)
Direct Cost of investment	WT	Withholding tax of dividend in destination countries
	CO	Chinn-Ito capital account openness index
Indirect Cost of investment	BILAT	Bilateral import and export between US and each destination country over US total import and export with all partner country
	INT	Share of internet user in destination country's population
	DIST	Distance from capital to capital
Incentive of Investment	EXVOL	Standard Deviation of monthly exchange rate. Exchange rate is expressed in terms of local currency per USD
	DIVER	1- correlation between US and destination country monthly MSCI return
	RAR	average monthly returns over the standard deviation of returns in the previous year of destination country
	ML	stock traded per GDP of destination country
Size	MCAP	Market capitalization/ World market capitalization
	GROWTH	Growth in the GDP per capita of the destination country
Governance	GOV	World governance indicators (WGI) index normalize 0-1

Note: All the variable definitions are summarized in Table 6.7.

6.2.3 Expected Sign and Hypothesis

For the comparison of US HB across consolidation groups, the hypothesis is that the mean of the US HB for the emerging countries should be higher than the developed countries as found by many previous literatures. We also expect the mean US HB for the consolidation groups that exclude US stock markets to be higher than those of the group that include the US stock markets.

When looking at the mean US HB in different period, for consolidation groups that include US stock markets, we expect the mean US HB to decrease for both the ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage as the US investors are now facilitated to trade stock with those stock markets. The IMPLEMENT stage should have a higher decrease than the ANNOUNCE as it is the stage where stock markets under the consolidation groups is allowed to trade under the common trading platform.

For consolidation groups that exclude US stock markets, we expect the mean US HB to decrease for both ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage as the bigger consolidated markets make these stock markets more attractive to invest in. However, the mean US HB for the stock markets under consolidation groups that exclude US stock markets might increase during ANNOUNCE and IMPLEMENT stages as the US investors might be more interested in investing in its own group than other groups.

When analyzing the factors affecting US HB, for the consolidation group that include US stock markets, the ANNOUNCE and IMPLEMENT variables are expected to have a negative effect on US HB as it is now easier for the US investors to invest in those countries. For the groups that exclude US stock markets, we also expect the ANNOUNCE and IMPLEMENT to have a negative effect as the bigger consolidated markets make these stock markets more attractive to invest in. However, there is also a possibility that ANNOUNCE and IMPLEMENT might have a positive effect on US HB since as the US since the US investors might be more interested in investing in its own group than other groups.

For the financial crisis variable, we expect the US financial crisis (CRISISUS) to have a negative effect on the US HB as US investors seek higher return in other countries. On the

other hand, Next, the Euro debt crisis (CRISISEU) is expected to have a positive effect on US HB as US investors would want to invest less in the EU countries.

For the direct cost of home bias, withholding tax (WT) of dividend yield in destination country is expended to have a positive effect on the US HB as it directly affects US investors return on investment. Next, capital account openness (CO) is expected to have a negative effect on the US HB as the higher the index means that the destination country has higher capital account openness.

For the indirect cost, bilateral trade (BILAT) is expected to have a negative effect on US HB as the higher BILAT is believed to lower the information cost between the two countries as investors can get more regulatory and accounting information via trade. Furthermore, the usage of internet (INT) is expected to have a negative effect on US HB as the higher INT means the internet is more accessible and the information cost of investing in the destination country should decline. Lastly, the distance between US and destination country (DIST) is expected to have a positive effect on US HB as the higher DIST believed to increase the information cost.

For the incentive of investment, the exchange rate volatility of the destination country (EXVOL) is expected to have a positive effect on US HB as people would prefer to invest in the country with less volatile exchange rate. Next, the diversification opportunity (DIVER) is expected to have a negative effect on US HB as the higher the DIVER the higher the incentive that the US investors want to invest in that stock markets. In addition, the historical risk-adjusted return (RAR) of the destination countries is expected to have a negative effect on US HB as the higher RAR gives more incentive of investment and the US should increase equity investment into that country. Lastly, the equity market liquidity (ML) is expected to have a negative effect on US HB as the higher the ML makes the destination country more attractive to invest in.

For the control variable regarding the size, market capitalization (MCAP) and growth in GDP per capita (GROWTH) of the destination countries makes the destination country more attractive for the US investors to invest in. Thus, both of this variable is expected to have a negative effect on US HB.

For the governance variable, governance indicators (GOV) is expected to have a negative effect on the US HB as the higher the WGI means the governance performance of the destination country is strong. As investors would want to invest in the country with better governance, the US investors would be more interested in investing in such a country. **Table 6.8** summarizes the expected sign for each independent variable.

Table 6.8 Expected sign

Independent Variables	Expected Sign
ANNOUNCE	-
IMPLEMENT	-
CRISISUS	-
CRISISEU	+
WT	+
CO	-
BILAT	-
INT	-
DIST	+
EXVOL	+
DIVER	+
RAR	-
ML	-
MCAP	-
GROWTH	-
GOV	-

Note: Table 6.8 summarizes the expected sign for each independent variable.

6.2.4 Descriptive Statistics

Descriptive statistics including the mean, standard deviation, minimum, maximum, skewness, kurtosis and the augmented Dicky-Fuller (ADF) unit root test for stationarity for the dependent and independent variables can be found in **Table 6.9**. The skewness range that the data would consider to be normal is between -2 and +2. HB, CO, INT, DIVER, RAR, ML, GROWTH, GOV is in the normal range while the BILAT, EXVOL and MCAP shows a sign of a little bit right-skewed. For a normal distribution, the kurtosis value equals to 3. HB, CO, DIVER, RAR, ML, GROWTH and GOV have the kurtosis value that is very close to 3 while the other variable shows to some extent the degree of leptokurtic or fat tails. The ADF test result shows that all of the variable rejects the null hypothesis and the variables are stationary. The skewness, kurtosis and unit root test are not conducted for the dummy variable and the variable that does not vary over time.

Table 6.9 Descriptive statistics

Variables	Mean	SD	Min	Max	Skewness	Kurtosis	ADF
HB	0.772	0.163	0.221	0.999	-0.838	3.198	-1.608*
ANNOUNCE	0.125	0.331	0	1	-	-	-
IMPLEMENT	0.528	0.499	0	1	-	-	-
CRISISUS	0.125	0.331	0	1	-	-	-
CRISISEU	0.125	0.331	0	1	-	-	-
WT	0.181	0.065	0.1	0.300	-	-	-
CO	0.843	0.262	0.165	1	-1.522	3.953	-2.182***
BILAT	0.013	0.025	0	0.141	3.653	16.166	-2.977***
INT	0.551	0.259	0.022	0.982	-0.207	1.908	-1.658**
DIST	8.851	0.382	8.016	9.651	-	-	-
EXVOL	7.576	29.745	0	285.818	6.291	48.009	-2.239***
DIVER	0.315	0.228	0	1	0.779	3.013	-1.791***
RAR	0.112	0.405	-1.008	1.268	0.182	2.643	-2.581***
ML	3.042	1.386	-0.265	5.355	-0.547	2.402	-1.591*
MCAP	0.009	0.015	0	0.084	2.817	10.821	-1.858***
GROWTH	0.044	0.105	-0.317	0.301	-0.360	2.918	-2.456***
GOV	0.627	0.269	0	1	-0.715	2.397	-1.595*

Note: Descriptive statistics including the mean, standard deviation, minimum, maximum, skewness, kurtosis and the augmented Dicky-Fuller (ADF) unit root test for stationarity for the dependent and independent variables can be found in Table 6.9.

A pairwise correlation matrix is reported in **Table 6.10,** where correlation significant at the 5% level or better are highlighted in bold. Consistent with the hypothesis, we find that IMPLEMENT is significantly and negatively correlated with HB. However, ANNOUNCE is not statistically significantly correlated with HB. Furthermore, according to **Table 6.11**, we find that the average value of Variance-Inflation-Factors (VIFs) is 2.25 and none of the VIFs exceeds 10.0, indicating that the multicollinearity is not an issue in our regressions.

Table 6.10 Pairwise Correlation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
(1) HB	1																
(2) ANNOUNCE	0.06	1															
(3) IMPLEMENT	**-0.21**	**-0.40**	1														
(4) CRISISUS	-0.01	0.03	-0.07	1													
(5) CRISISEU	-0.04	0.01	**0.16**	**-0.14**	1												
(6) WT	**0.40**	0.01	**-0.18**	-0.00	-0.00	1											
(7) CO	**-0.34**	0.03	**0.18**	0.06	-0.00	**-0.24**	1										
(8) BILAT	**-0.39**	-0.03	**-0.16**	-0.01	-0.01	**-0.24**	**-0.11**	1									
(9) INT	**-0.34**	-0.07	**0.65**	0.01	**0.13**	**-0.24**	**0.31**	**-0.21**	1								
(10) DIST	**0.14**	0.01	-0.07	0.00	0.00	**0.32**	-0.05	**-0.41**	-0.01	1							
(11) EXVOL	**0.22**	0.07	-0.09	-0.01	0.02	**0.38**	**-0.32**	-0.07	**-0.21**	**-0.26**	1						
(12) DIVER	**0.61**	-0.01	**-0.33**	**0.12**	**-0.26**	**0.19**	**-0.31**	**-0.29**	**-0.33**	0.03	0.11	1					
(13) RAR	0.06	-0.01	**-0.11**	**0.28**	**0.14**	0.01	-0.02	-0.02	-0.02	-0.04	-0.04	**0.125**	1				
(14) ML	**-0.49**	0.08	0.06	**0.17**	0.01	**-0.13**	**0.18**	0.02	**0.30**	**0.33**	**-0.23**	**-0.47**	-0.01	1			
(15) MCAP	**-0.47**	0.01	0.07	0.01	-0.01	**-0.15**	**0.22**	**0.26**	**0.14**	-0.08	**-0.11**	**-0.40**	-0.05	**0.45**	1		
(16) GROWTH	**0.14**	**0.19**	**-0.28**	**0.27**	**-0.26**	0.10	0.01	-0.04	**-0.19**	0.05	-0.04	0.10	**0.24**	0.01	-0.05	1	
(17) GOV	**-0.33**	0.04	**0.23**	-0.01	-0.02	**-0.34**	**0.52**	**-0.30**	**0.66**	0.09	**-0.34**	**-0.24**	0.00	**0.47**	**0.21**	-0.07	1

Note: A pairwise correlation matrix is reported in Table 6.10, where correlation significant at the 5% level or better are highlighted in bold.

Table 6.11 Variance-Inflation-Factors (VIFs)

Variables	VIFs
HB	2.61
ANNOUNCE	1.46
IMPLEMENT	3.26
CRISISUS	1.33
CRISISEU	1.35
WT	1.91
CO	1.88
BILAT	2.61
INT	4.03
DIST	2.35
EXVOL	1.88
DIVER	2.6
RAR	1.27
ML	2.78
MCAP	1.52
GROWTH	1.39
GOV	4.03
Mean VIFs	2.25

Note: according to Table 6.11, we find that the average value of Variance-Inflation-Factors (VIFs) is 2.25 and none of the VIFs exceeds 10.0, indicating that the multicollinearity is not an issue in our regressions.

6.3 Methodology

6.3.1 Conceptual Model

As mentioned earlier in the literature review part, it is generally accepted that the bilateral home bias can be calculated from equation **(6.1)**

$$\mathbf{HB_{ij} = 1 - \frac{ACT_{ij}}{OPT_{ij}}} \quad \textbf{(6.1)}$$

where HB_{ij} is the home bias of the country i toward country j. ACT_{ij} is the actual weight that the country i invest in country j calculated from the share of country i equity investment in destination country j. OPT_{ij} is the optimal weight that the country i should invest in country j calculated from the proportion of country j's market capitalization in the world market capitalization. In this chapter, the home country is US and the destination countries are the 22 countries that went under the 6 stock market consolidations. The actual weight of foreign holdings of domestic country can be calculated from equation **(6.2)**

$$\boldsymbol{Actual} = \frac{\textbf{Foreign equity asset}}{\textbf{Foreign equity asset+Domestic market capitalization}- \textbf{Foreign equity liability}} \quad \textbf{(6.2)}$$

where the nominator is the domestic country's holding of foreign equity asset in each destination country and the denominator is the domestic country's total equity holding calculated from domestic country's holding of foreign equity asset plus the domestic total market capitalisation minus the foreign country's holding of domestic equity. The actual weight is then the domestic country's foreign equity holding divided by the total equity holding.

For the optimal portfolio weight, many studies use International Capital Asset Pricing Model (ICAPM) to calculate optimal portfolio weight (Ahearne et al. 2004; Chan et al. 2005; Sercu and Vanpée 2008; Bekaert and Wang 2009; Chan et al. 2009; Lau et al. 2010). The ICAPM assumes that every investor is of the mean-variance type and has the same beliefs about the distribution of real asset returns. All investors face identical investment opportunities and there are no transaction costs or taxes. The ICAPM implies that all investors hold the world market portfolio, which is a portfolio where the weight of each asset is equal to its relative share in the world market capitalization (Cooper and Kaplanis 1994). ICAPM optimal weight can be calculated from equation **(6.3)**

$$\textbf{ICAPM Optimal Weight} = \frac{\textbf{Market Capitalization of destination countries}}{\textbf{World Market Capitalization}} \quad \textbf{(6.3)}$$

Where the nominator is the destination countries' market capitalization of listed companies and the denominator is the world market capitalization of listed companies. To interpret the degree of bilateral home bias, the home bias value is zero when the actual and the optimal weights are equal, meaning domestic investors diversify their investment in each destination country according to the optimal portfolio weight, and there is no home bias toward that destination country. When investors hold only domestic asset, the actual weight is zero and the home bias value is one meaning domestic investors do not diversify their investment in that destination country and invest only in their country.

We will use float-adjusted HB (HB_FLOAT) as a robustness check for HB measure. Float share is the shares that are not closely held by small groups of controlling shareholders and are freely available to trade in each country. This data is obtained from the Worldscope database access via Datastream. To calculate HB_FLOAT, the ICAPM optimal weight as shown in equation **(6.3)** is adjusted by the percentage of float share available to trade in each stock markets. The float-adjusted market capitalization of the destination countries is calculated from the market capitalization of destination countries multiplied by the percentage of float share in that country as shown in equation **(6.4)**.

$$\boldsymbol{Float - adjusted\ market\ capitalization\ of\ the\ destination\ countries} = \boldsymbol{Market\ Capitalization\ of\ destination\ countries} * \%\ \boldsymbol{of\ float\ share\ in\ that\ country} \quad \textbf{(6.4)}$$

The float-adjusted world market capitalization is the sum of the float-adjusted market capitalization of all the countries that the US invest in as shown in equation **(6.5)**.

$$Float - adjusted\ world\ market\ capitalization = \sum_{0}^{n} Float - adjusted\ market\ capitalization\ of\ the\ destination\ countries \quad \textbf{(6.5)}$$

6.3.2 Empirical Model

To investigate the stock market consolidations effect on US HB, we employed a random effect OLS panel regression to estimate equation **(6.6)**. We use random effect as the Breusch and Pagan test suggests that the random effect model is preferred to the pooled OLS model and the Hausman test suggests that the random effect is preferred to the fixed effect model (**Table B-8** and **B-9** in **Appendix B**). Independent variable of different stages of stock market consolidation ANNOUNCE and IMPLEMENT are included. We also include the control variable of US global financial crisis, Euro debt crisis, direct cost of investment, indirect cost of investment, incentive of investment, size and governance.

$$\mathbf{HB}_{i,t} = \alpha_{i,t} + \beta_1 ANNOUNCE_{i,t} + \beta_2 IMPLEMENT_{i,t} + \beta_3 CRISISUS_{i,t} + \beta_4 CRISISEU_{i,t} + \beta_5 WT_{i,t-1} + \beta_6 CO_{i,t-1} + \beta_7 BILAT_{i,t-1} + \beta_8 INT_{i,t-1} + \beta_9 DIST_{i,t-1} + \beta_{10} EXVOL_{i,t-1} + \beta_{11} DIVER_{i,t-1} + \beta_{12} RAR_{i,t-1} + \beta_{13} ML_{i,t-1} + \beta_{14} MCAP_{i,t-1} \beta_{15} GROWTH_{i,t-1} + \beta_{16} GOV_{i,t-1} + \varepsilon_{i.t} \quad \textbf{(6.6)}$$

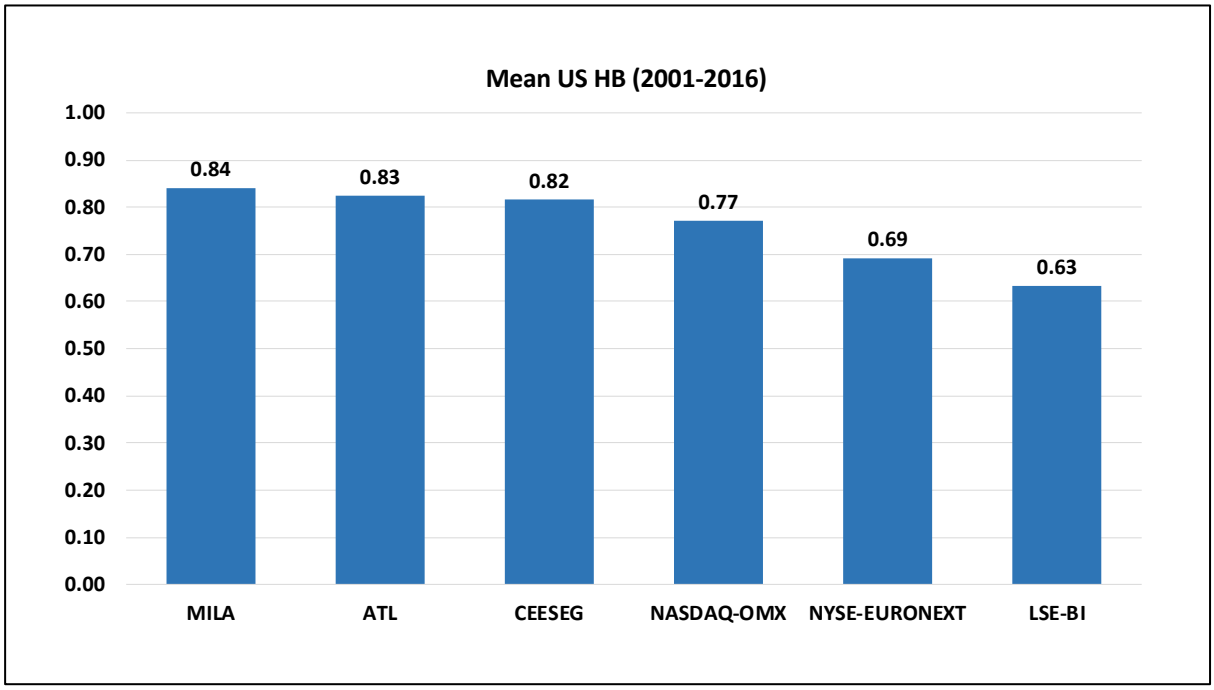
To make sure that the result is robust, we will report Newey-West robust standard error in the result to avoid potential issue arising from heteroscedasticity and autocorrelation. To check for omitted variable bias issue, we apply the Ramsey reset test and found that there is no omitted variable bias in the model (**Table B-7** in **Appendix B**). We also solved for the reverse causality problem by including the lagged independent variable as shown in equation **(6.6)**. The result is clustered by the consolidation group to make sure that the result is not affected by the common characteristics within each group. To take into account for the outlier, all the variables are winsorized at a 95% confidence interval.

6.4 Result

6.4.1 Comparison of US HB

To see the overall picture, we compare the mean US HB for six stock market consolidation groups in our sample during the year 2001-2016. According to **Figure 6.1,** the stock market consolidation group that has the highest mean of the US HB is MILA (0.84) followed by ATL (0.83), CEESEG (0.82), NASDAQ-OMX (0.77), NYSE-EURONEXT (0.69), and the group that has the lowest mean is LSE-BI (0.63)

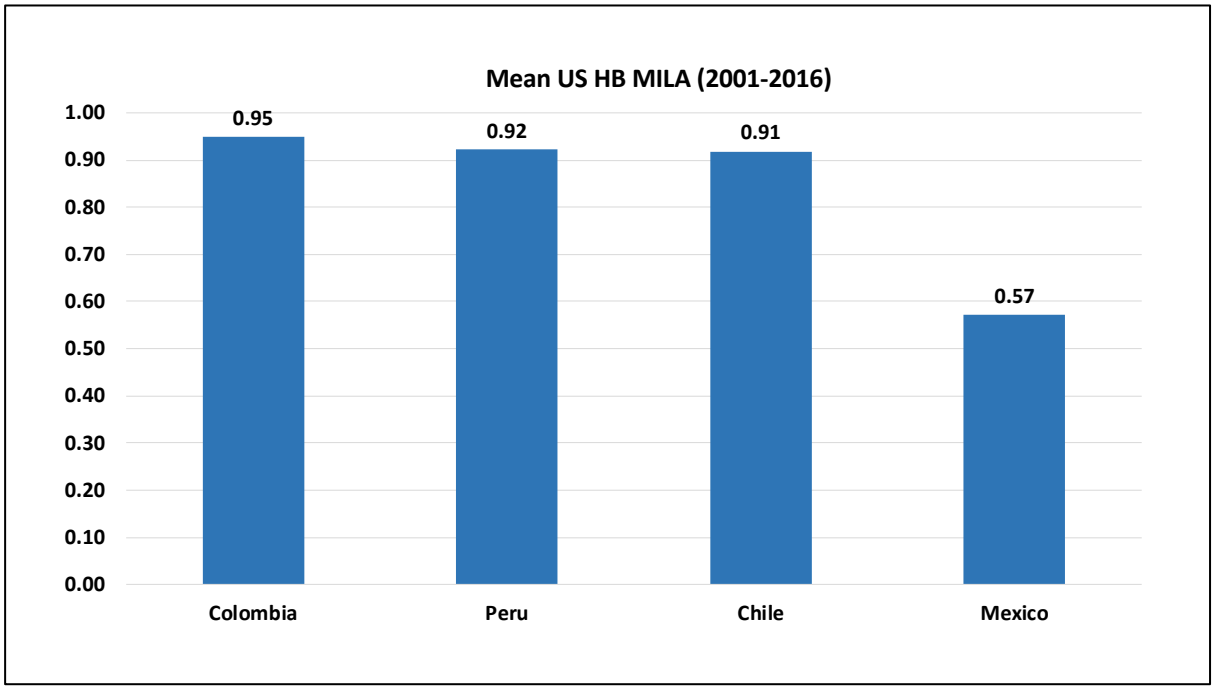
Figure 6.1 Mean US Home Bias (2001-2016)



Note: According to Figure 6.1, the stock market consolidation group that has the highest mean of the US HB is MILA (0.84) followed by ATL (0.83), CEESEG (0.82), NASDAQ-OMX (0.77), NYSE-EURONEXT (0.69), and the group that has the lowest mean is LSE-BI (0.63)

To look at US HB for each stock market consolidation groups in detail, we compare the mean US HB for each stock market within each group. **Figure 6.2** shows the mean US HB of the stock markets under MILA during the year 2000-2016. The stock market that has the highest mean US HB is Colombia (0.95) followed by Peru (0.92) Chile (0.91) and Mexico (0.57).

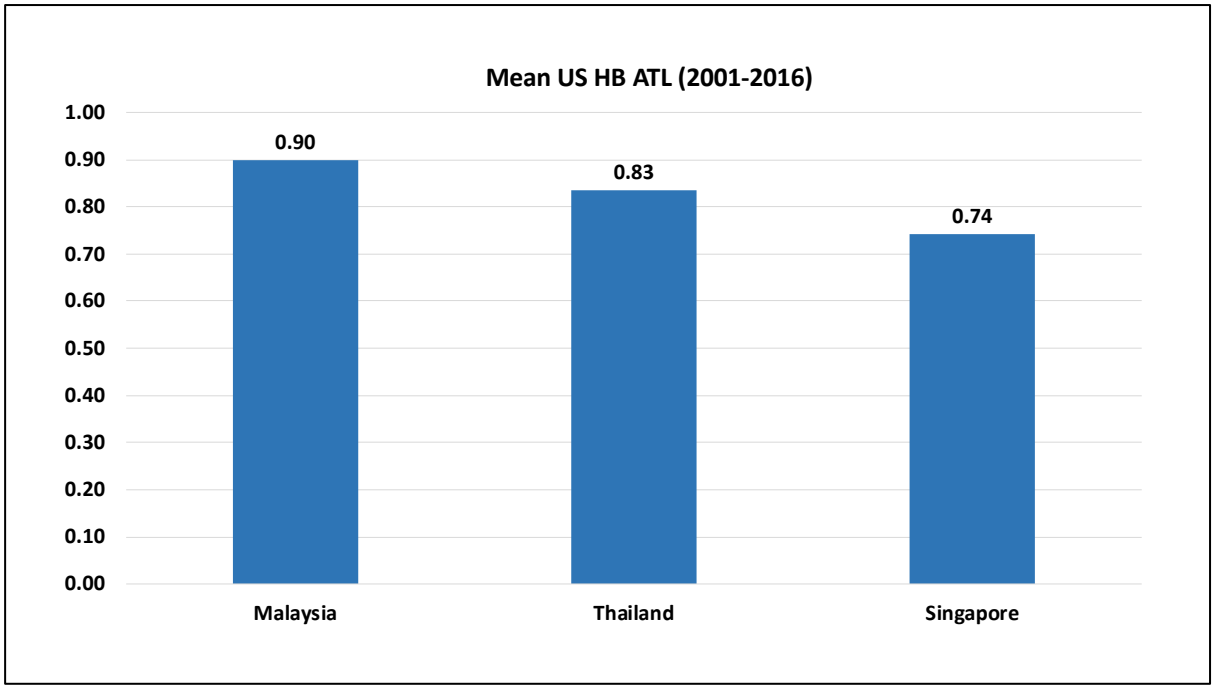
Figure 6.2 Mean US HB for MILA (2001-2016)



Note: Figure 6.2 shows the mean US HB of the stock markets under MILA during the year 2000-2016. The stock market that has the highest mean US HB is Colombia (0.95) followed by Peru (0.92) Chile (0.91) and Mexico (0.57).

Figure 6.3 shows the mean US HB of the stock markets under ATL during the year 2001-2016. The stock market that has the highest mean US HB is Malaysia (0.90), followed by Singapore (0.83) and Thailand (0.74).

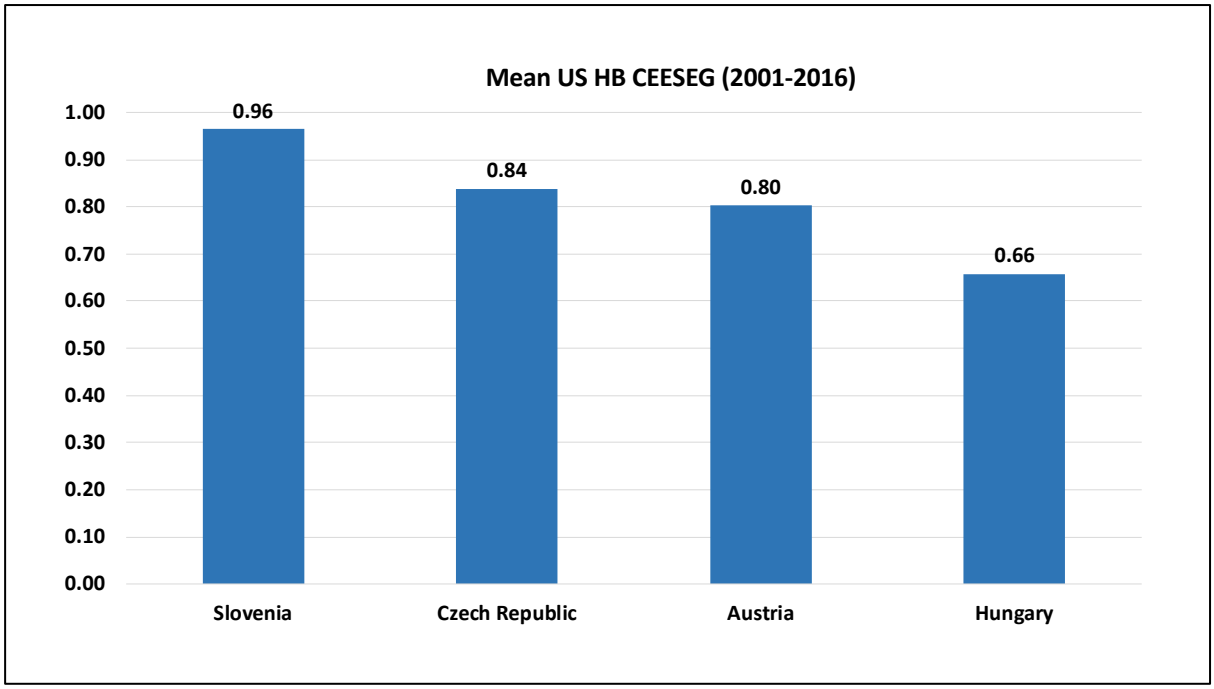
Figure 6.3 Mean US HB for ATL (2001-2016)



Note: Figure 6.3 shows the mean US HB of the stock markets under ATL during the year 2001-2016. The stock market that has the highest mean US HB is Malaysia (0.90), followed by Singapore (0.83) and Thailand (0.74).

Figure 6.4 shows the mean US HB of the stock markets under CEESEG during the year 2001-2016. The stock market that has the highest mean US HB is Slovenia (0.96) followed by Czech Republic (0.84), Austria (0.80) and Hungary (0.66).

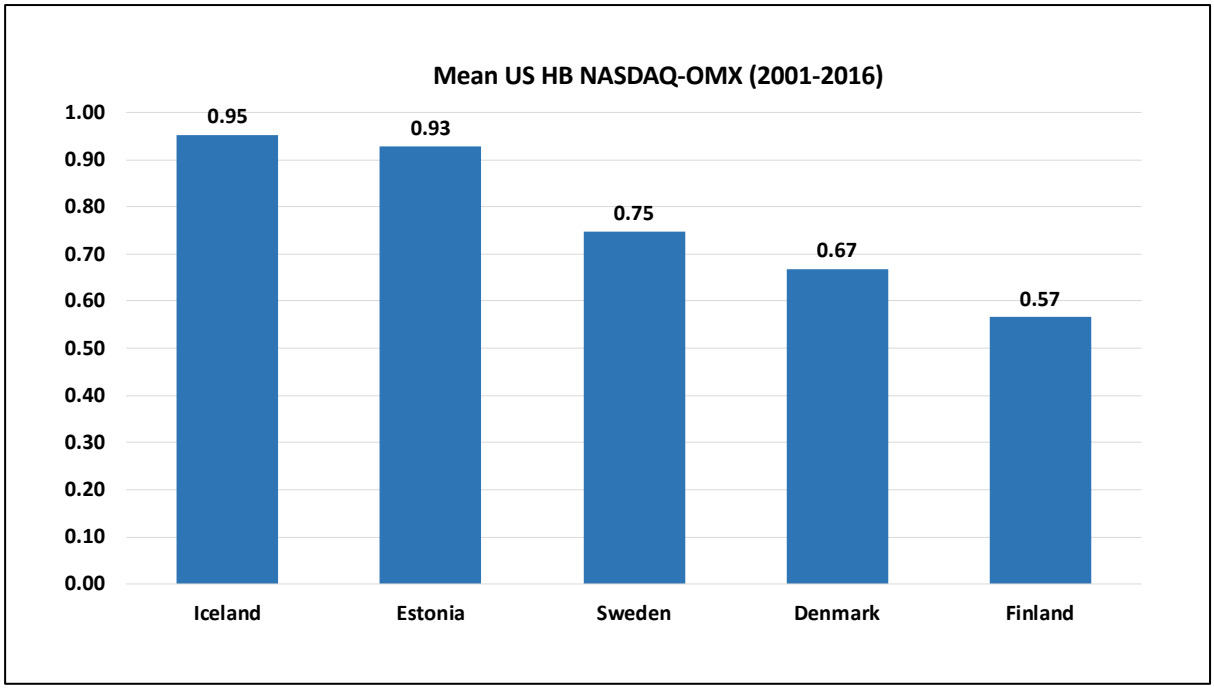
Figure 6.4 Mean US HB for CEESEG (2001-2016)



Note: Figure 6.4 shows the mean US HB of the stock markets under CEESEG during the year 2001-2016. The stock market that has the highest mean US HB is Slovenia (0.96) followed by Czech Republic (0.84), Austria (0.80) and Hungary (0.66).

Figure 6.5 shows the mean US HB of the stock markets under NASDAQ-OMX during the year 2001-2016. The stock market that has the highest mean US HB is Iceland (0.95), followed by Estonia (0.93), Sweden (0.75), Denmark (0.67), and Finland (0.57).

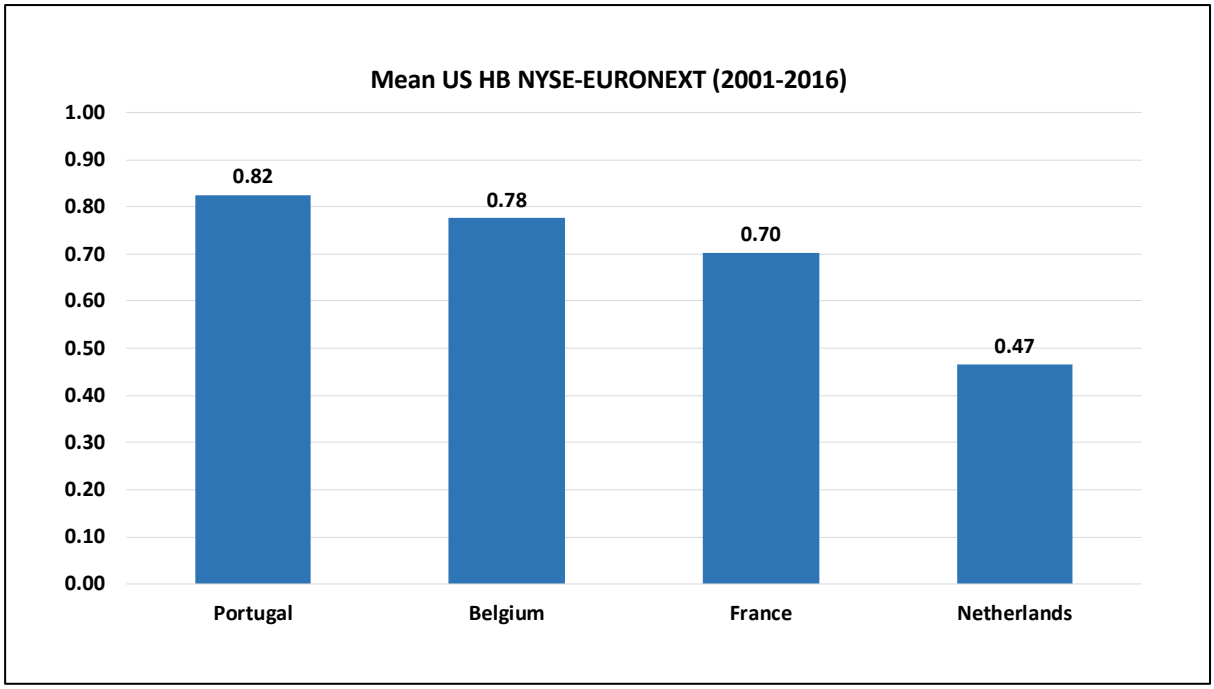
Figure 6.5 Mean US HB for NASDAQ-OMX (2001-2016)



Note: Figure 6.5 shows the mean US HB of the stock markets under NASDAQ-OMX during the year 2001-2016. The stock market that has the highest mean US HB is Iceland (0.95), followed by Estonia (0.93), Sweden (0.75), Denmark (0.67), and Finland (0.57).

Figure 6.6 shows the mean US HB of the stock markets under NYSE-EURONEXT during the year 2001-2016. The country that has the highest mean US HB is Portugal (0.82), followed by Belgium (0.78), France (0.70) and Netherland (0.47).

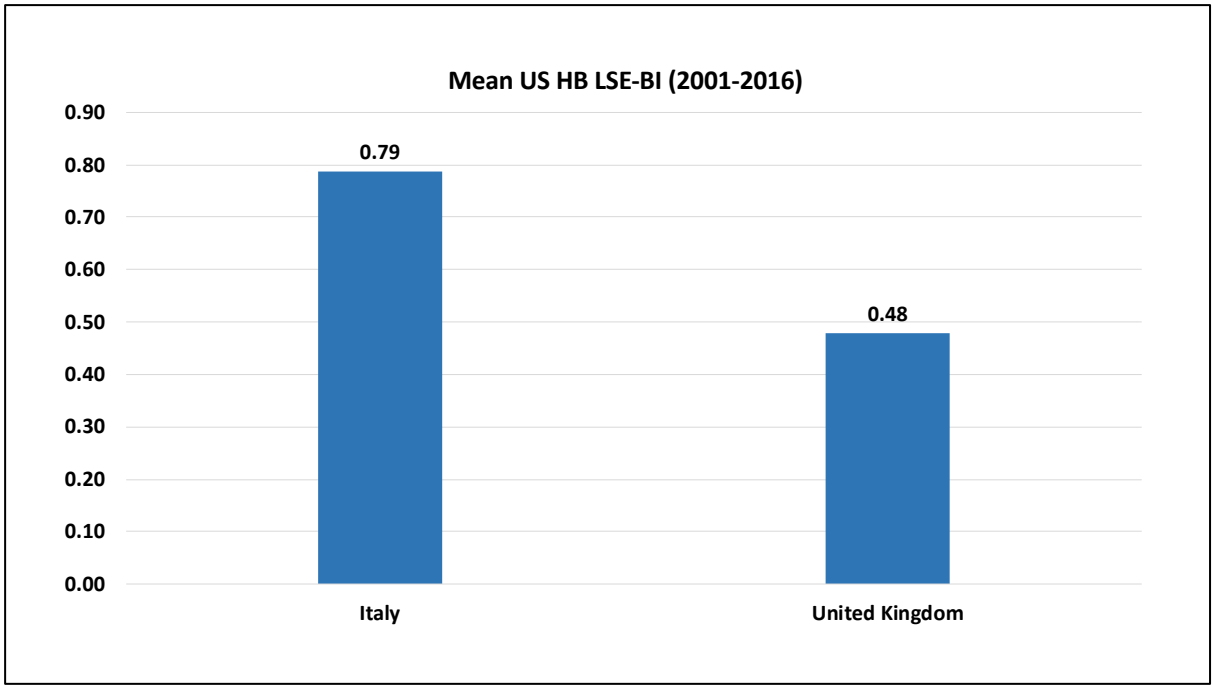
Figure 6.6 Mean US HB for NYSE-EURONEXT (2001-2016)



Note: Figure 6.6 shows the mean US HB of the stock markets under NYSE-EURONEXT during the year 2001-2016. The country that has the highest mean US HB is Portugal (0.82), followed by Belgium (0.78), France (0.70) and Netherland (0.47).

Figure 6.7 shows the mean US HB of the stock markets under LSE-BI during the year 2001-2016. The country that has the highest mean US HB is Italy (0.79) followed by UK (0.48).

Figure 6.7 Mean US HB for LSE-BI (2001-2016)

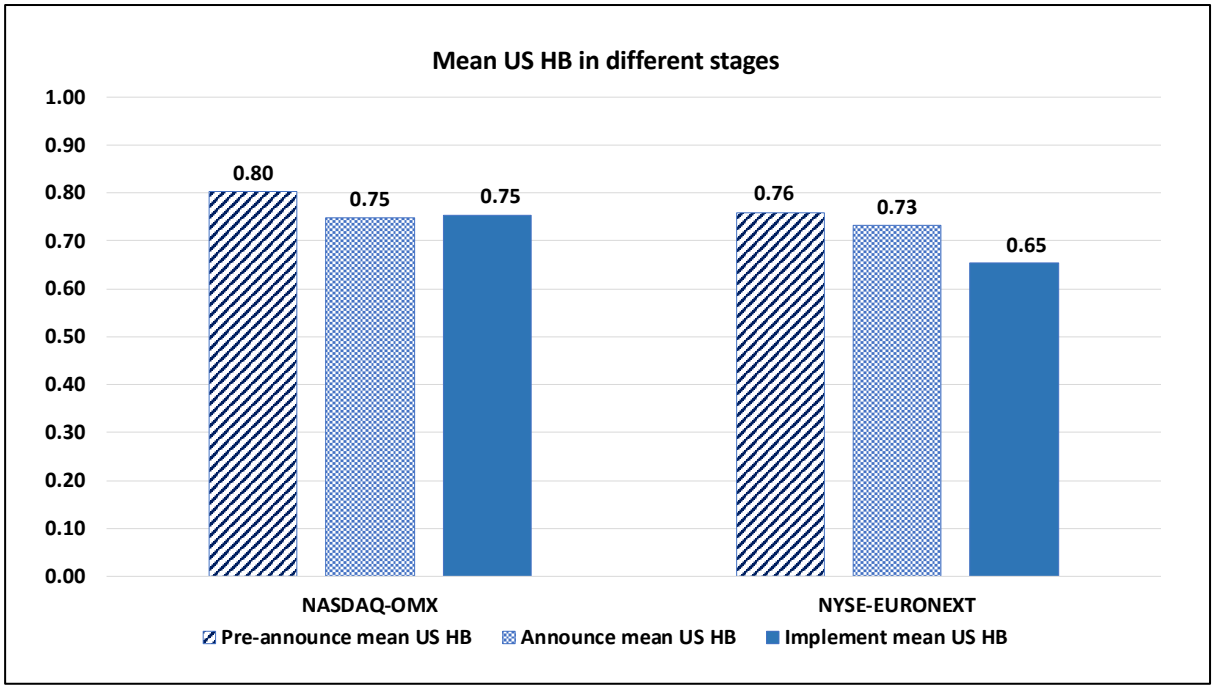


Note: Figure 6.7 shows the mean US HB of the stock markets under LSE-BI during the year 2001-2016. The country that has the highest mean US HB is Italy (0.79) followed by UK (0.48).

6.4.2 Mean US HB in different stages

We compare the mean US HB in the pre-announce, ANNOUNCE and IMPLEMENT stages for the stock market consolidation groups including US stock markets and the groups that exclude the US stock markets. For the groups that include the US stock market, **Figure 6.8** shows that mean US HB decreased for the ANNOUNCE and IMPLEMENT comparing to the pre-announce stage for both NYSE-EURONEXT and NASDAQ-OMX group.

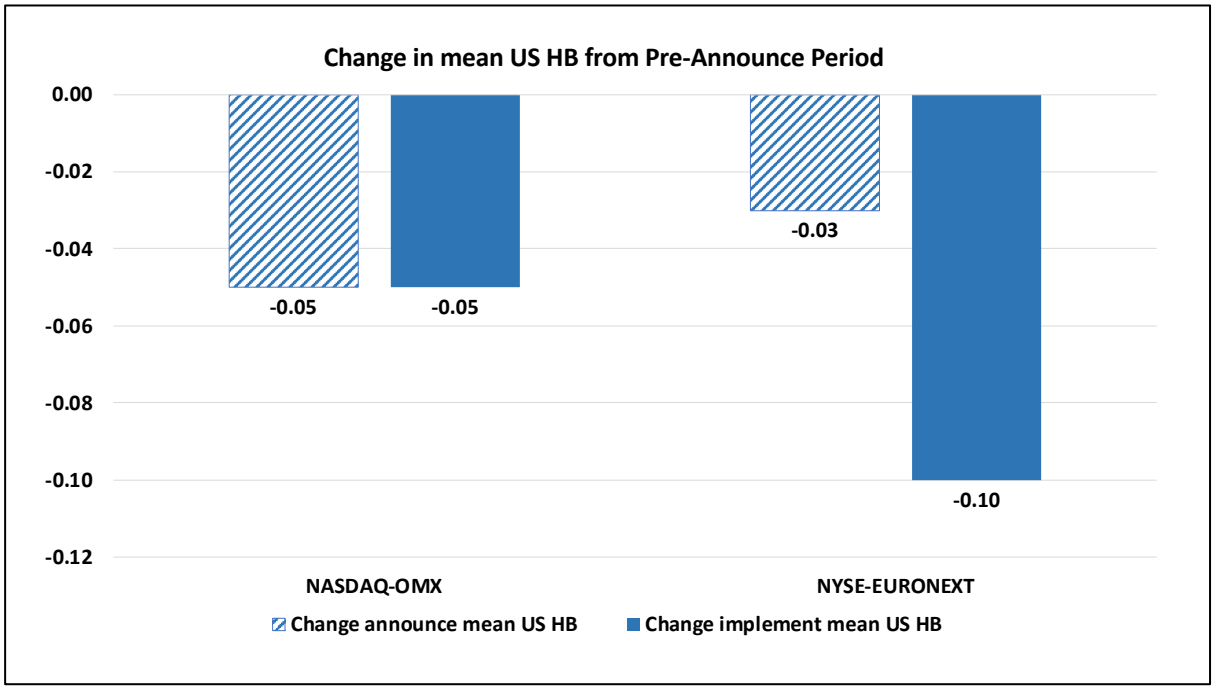
Figure 6.8 Mean US HB for stock market consolidation groups including US stock markets in different stages



Note: For the groups that include the US stock market, Figure 6.8 shows that mean US HB decreased for the ANNOUNCE and IMPLEMENT comparing to the pre-announce stage for both NYSE-EURONEXT and NASDAQ-OMX group.

To make it easier to understand, we compare the change in mean US HB of ANNOUNCE and IMPLEMENT stages from the pre-announce stage for the two groups. According to **Figure 6.9,** for announce stage, NASDAQ-OMX has a higher decrease (-0.05) than the NYSE-EURONEXT (-0.03). For implement stage, NYSE-EURONEXT has a higher decrease (-0.10) than the NASDAQ-OMX (-0.05).

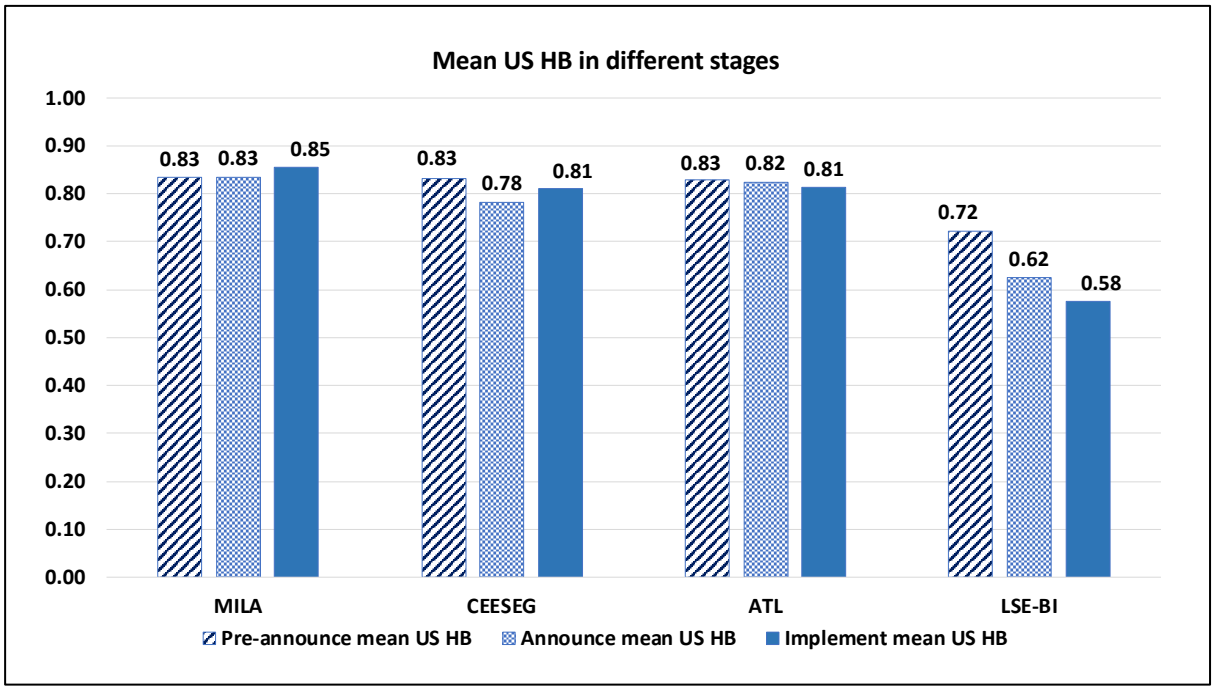
Figure 6.9 Change in mean US HB from pre-announce stage



Note: According to Figure 6.9, for announce stage, NASDAQ-OMX has a higher decrease (-0.05) than the NYSE-EURONEXT (-0.03). For implement stage, NYSE-EURONEXT has a higher decrease (-0.10) than the NASDAQ-OMX (-0.05).

For the groups that exclude the US stock market, **Figure 6.10** shows that mean US HB decreased for the ANNOUNCE and IMPLEMENT comparing to the pre-announce stage for CEESEG, ATL and LSE-BI group. However, the ANNOUNCE stage for MILA is the same as the pre-announce stage and increase a bit during the IMPLEMENT stage.

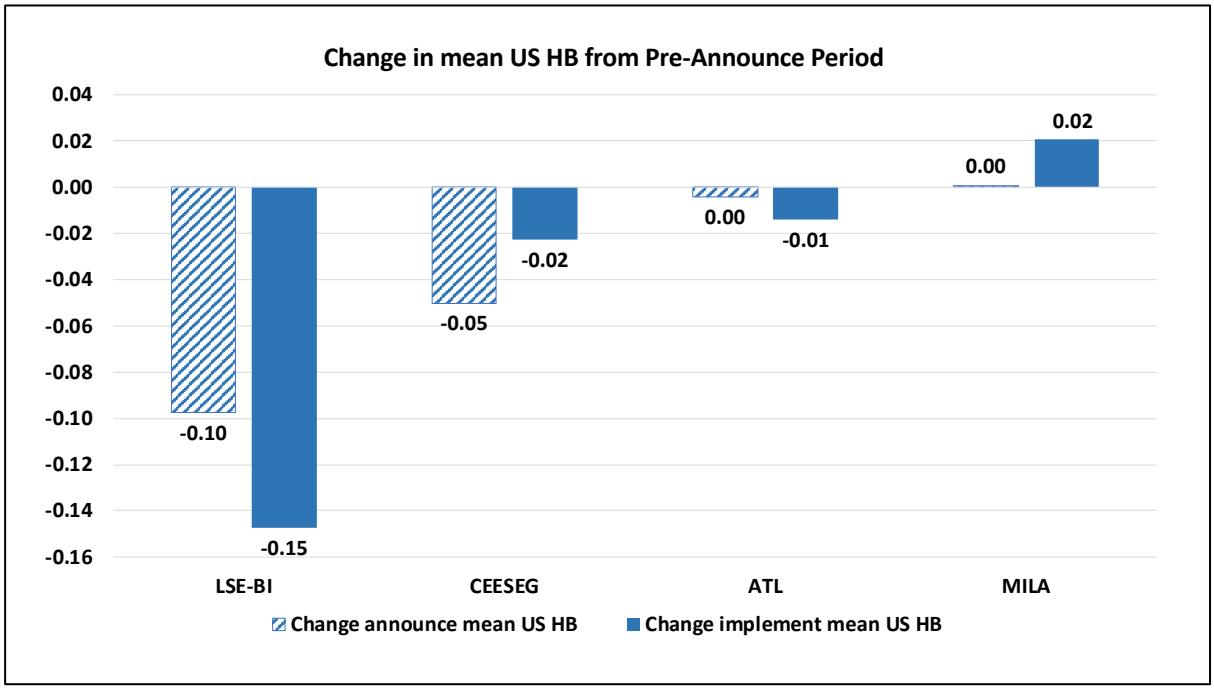
Figure 6.10 Mean US HB for stock market consolidation groups excluding US stock markets in different stages



Note: For the groups that exclude the US stock market, Figure 6.10 shows that mean US HB decreased for the ANNOUNCE and IMPLEMENT comparing to the pre-announce stage for CEESEG, ATL and LSE-BI group. However, the ANNOUNCE stage for MILA is the same as the pre-announce stage and increase a bit during the IMPLEMENT stage.

To make it easier to understand, we compare the change in mean US HB of ANNOUNCE and IMPLEMENT stages from the pre-announce stage for all the four groups. According to **Figure 6.11,** for announce stage, LSE-BI has the highest decrease (-0.10) followed by CEESEG (-0.05), ATL (0.00) and MILA (0.00). For implement stage, LSE-BI has the highest decrease (-0.15) followed by CEESEG (-0.02), ATL (-0.01) and MILA (0.02).

Figure 6.11 Change in mean US HB from pre-announce stage



Note: According to Figure 6.11, for announce stage, LSE-BI has the highest decrease (-0.10) followed by CEESEG (-0.05), ATL (0.00) and MILA (0.00). For implement stage, LSE-BI has the highest decrease (-0.15) followed by CEESEG (-0.02), ATL (-0.01) and MILA (0.02).

6.4.3 Factors affecting US HB

From the previous section, we can see that the mean US HB for most consolidation groups decreased during the announcement and implement stages. However, this could be due to other factors, so we conduct the OLS random effect panel regression to see the effect of stock market consolidation on US HB controlling for other factors such as financial crisis, direct cost of investment, indirect cost of investment, incentive of investment, size and governance. We first conduct the OLS fixed effect panel regression for the consolidation group that includes US stock markets (NYSE-EURONEXT and NASDAQ-OMX) and the consolidation group that exclude the US stock markets (LSE-BI, CEESEG, MILA and ATL).

We analyze separately the effect of the ANNOUNCE and the IMPLEMENT stages on US HB. We use ICAPM optimal weight adjusted for float share (FLOAT) and ICAPM optimal weight (ICAPM) as measures of US HB for the result shown in Model (1) HB_FLOAT and Model (2) HB_ICAPM respectively. **Table 6.12** shows the OLS random effect panel regression result for NYSE-EURONEXT consolidation group.

For Model (1), the result shows that ANNOUNCE statistically significantly increases US HB by 0.090 while IMPLEMENT does not have a significant effect on US HB. For the control variable, the variable that has the highest positive and significant impact on US DB is BILAT (23.341). Furthermore, the variable that has the highest negative and significant impact on US HB is MCAP (-18.298) followed by INT (-0.844) and DIVER (-0.146). However, CRISISUS, CRISISEU, CO, DIST, EXVOL, RAR, ML GROWTH and GOV do not have a significant effect on US HB. The R-square for model (1) is 0.91.

For model (2), the result shows that ANNOUNCE and IMPLEMENT does not have a significant effect on US HB. For the control variable, the variable that has the highest positive and significant impact on US HB is EXVOL (0.995) followed by GROWTH (0.105). Furthermore, the variable that has the highest negative and significant impact on US HB is GOV (-1.192) followed by DIST (-0.600) and INT (-0.312). However, CRISISUS, CRISISEU, CO, BILAT, DIVER, RAR, ML and MCAP do not have a significant effect on US HB. The R-square for model (2) is 0.91.

The result for the stock market consolidation effect on US HB are robust across the two models where IMPLEMENT does not have a significant effect on US HB. However, ANNOUNCE is positive and significant for model (1) but insignificant for model (2). For other control variables, the results are robust for INT where the variable is negative and statistically significant. In addition, the result for CRISISUS, CRISISEU, CO, RAR, ML are also robust where the variables are not statistically significant. On the other hand, the result for BILAT, DIVER and MCAP are significant in model (1) but not in model (2) and the result for DIST, EXVOL, GROWTH and GOV are significant in model (2) but not in model (1).

Table 6.12 Random effect OLS panel regressions include US markets: NYSE-EURONEXT

Dependent Variable =	Model (1) HB_FLOAT	Model (2) HB_ICAPM
ANNOUNCE	0.090**	0.008
	(-0.03)	(-0.02)
IMPLEMENT	0.041	-0.042
	(-0.09)	(-0.03)
CRISISUS	0.026	0.044
	(-0.07)	(-0.03)
CRISISEU	0.005	0.043
	(-0.04)	(-0.04)
CO	0.107	0.133
	(-0.26)	(-0.13)
BILAT	23.341***	-4.294
	(-2.00)	(-3.13)
INT	-0.844***	-0.312**
	(-0.24)	(-0.11)
DIST	0.100	-0.600***
	(-0.17)	(-0.08)
EXVOL	0.024	0.995**
	(-0.57)	(-0.38)
DIVER	-0.146*	0.073
	(-0.07)	(-0.08)
RAR	0.045	0.011
	(-0.03)	(-0.02)
ML	0.023	-0.037
	(-0.05)	(-0.02)
MCAP	-18.298***	-1.783
	(-1.30)	(-1.26)
GROWTH	0.07	0.105**
	(-0.06)	(-0.04)
GOV	-0.48	-1.192***
	(-0.34)	(-0.12)
CONSTANT	0.388	7.125***
	(-1.83)	(-0.80)
Obs	64	64
R-Square	0.91	0.91
Cluster Country	Yes	Yes

Note: The dependent variable is US equity Home Bias (HB). ANNOUNCE is dummy for stock market consolidation announcement period. IMPLEMENT is the dummy for stock market consolidation implement period. Next, CRISISUS is the dummy for the global financial crisis started in the US. CRISISEU is the dummy for the European debt crisis. WT is the withholding tax, omitted due to collinearity. CO is the capital account openness index. BILAT is the percentage of the bilateral trade between the US and the destination countries. INT is the percentage of the individual using the internet per population. DIST is the distance from capital to capital. EXVOL is exchange rate volatility. DIVER is the diversification opportunity of the destination countries. RAR is the risk adjusted return. ML is the equity market liquidity measure by the stock traded per GDP. MCAP is the market capitalization over GDP of the destination country's stock market. GROWTH is the growth in GDP per Capita. GOV is the WGI governance indicators. For interpretation, the statistical significance is reported against 10% (*), 5% (**) and 1% (***) significance level.

Table 6.13 shows the OLS random effect panel regression result for NASDAQ-OMX consolidation group. For Model (1), the result shows that both ANNOUNCE and IMPLEMENT does not have a significant effect on US HB. For the control variable, the variable that has the highest positive and significant impact on US HB is DIVER (0.058) followed by EXVOL (0.003). Furthermore, the variable that has the highest negative and significant impact on US HB is DIST (-0.794) followed by GOV (-0.718). However, CRISISUS, CRISISEU, CO, BILAT, INT, RAR, ML, MCAP GROWTH and do not have a significant effect on US HB. The R-square for model (1) is 0.68.

For model (2), the result shows that ANNOUNCE and IMPLEMENT does not have a significant effect on US HB. For the control variable, the variable that has the highest positive and significant impact on US HB is CO (0.443) followed by EXVOL (0.995). Furthermore, the variable that has the highest negative and significant impact on US HB is DIST (-0.600) followed by GOV (-1.192). However, CRISISUS, CRISISEU, BILAT, INT, DIVER, RAR, ML, MCAP and GROWTH do not have a significant effect on US HB. The R-square for model (2) is 0.78.

The result for the stock market consolidation effect on US HB are robust across the two models where ANNOUNCE and IMPLEMENT does not have a significant effect on US HB. For other control variables, the results are robust for DIST and GOV where the variable is negative and statistically significant. The result is also robust for EXVOL where the variable is positive and statistically significant. In addition, the result for CRISISUS, CRISISEU, BILAT, INT RAR, ML, MCAP and GROWTH are also robust where the variables are not statistically significant. On the other hand, the result for DIVER is significant in model (1) but not in model (2) and the result for CO is significant in model (2) but not in model (1).

Table 6.13 Random effect OLS panel regressions include US markets: NASDAQ-OMX

Dependent Variable =	Model (1) HB_FLOAT	Model (2) HB_ICAPM
ANNOUNCE	-0.078	-0.091
	(-0.08)	(-0.09)
IMPLEMENT	-0.069	-0.067
	(-0.11)	(-0.13)
CRISISUS	0.035	0.027
	(-0.08)	(-0.10)
CRISISEU	0.006	-0.018
	(-0.03)	(-0.03)
CO	0.214	0.443**
	(-0.16)	(-0.17)
BILAT	24.087	33.021
	(-20.19)	(-27.87)
INT	0.183	0.162
	(-0.12)	(-0.11)
DIST	-0.794***	-1.178***
	(-0.19)	(-0.24)
EXVOL	0.003*	0.006***
	(0.00)	(0.00)
DIVER	0.058**	-0.049
	(-0.02)	(-0.05)
RAR	-0.03	-0.013
	(-0.04)	(-0.04)
ML	-0.01	-0.018
	(-0.02)	(-0.03)
MCAP	-1.077	-12.031
	(-16.96)	(-20.43)
GROWTH	0.02	-0.017
	(-0.10)	(-0.10)
GOV	-0.718***	-1.103***
	(-0.08)	(-0.18)
CONSTANT	8.026***	11.596***
	(-1.57)	(-1.97)
Obs	80	80
R-Square	0.68	0.78
Cluster Country	Yes	Yes

Note: The dependent variable is US equity Home Bias (HB). ANNOUNCE is dummy for stock market consolidation announcement period. IMPLEMENT is the dummy for stock market consolidation implement period. Next, CRISISUS is the dummy for the global financial crisis started in the US. CRISISEU is the dummy for the European debt crisis. WT is the withholding tax, omitted due to collinearity. CO is the capital account openness index. BILAT is the percentage of the bilateral trade between the US and the destination countries. INT is the percentage of the individual using the internet per population. DIST is the distance from capital to capital. EXVOL is exchange rate volatility. DIVER is the diversification opportunity of the destination countries. RAR is the risk adjusted return. ML is the equity market liquidity measure by the stock traded per GDP. MCAP is the market capitalization over GDP of the destination country's stock market. GROWTH is the growth in GDP per Capita. GOV is the WGI governance indicators. For interpretation, the statistical significance is reported against 10% (*), 5% (**) and 1% (***) significance level.

Table 6.14 shows the OLS random effect panel regression result for the consolidation group excluding US stock markets. For Model (1), the result shows that both ANNOUNCE and IMPLEMENT do not have a significant effect on US HB. For the control variable, the variable that has the highest positive and significant impact on US HB is CRISISEU (0.037). Furthermore, the variable that has the highest negative and significant impact on US HB is BILAT (-2.864) followed by RAR (-0.012). However, CRISISUS, WT, CO, INT, DIST, EXVOL, DIVER, ML, MCAP, GROWTH and GOV do not have a significant effect on US HB. The R-square for model (1) is 0.55.

For model (2), the result shows that both ANNOUNCE and IMPLEMENT positively and significantly increases US HB by 0.040 and 0.027 respectively. For the control variable, the variable that has the highest positive and significant impact on US HB is WT (0.502) followed by DIVER (0.124) and CRISISEU (0.021). Furthermore, the variable that has the highest negative and significant impact on US HB is BILAT (-1.314). However, CRISISUS, CO, INT, DIST, EXVOL, RAR, ML, MCAP, GROWTH and GOV do not have a significant effect on US HB. The R-square for model (2) is 0.71.

The result for the stock market consolidation effect on US HB are not robust across the two models where ANNOUNCE and IMPLEMENT is significant in model (2) but insignificant in model (1). For other control variables, the results are robust for BILAT where the variable is negative and statistically significant. The result is also robust for CRISISEU where the variable is positive and statistically significant. In addition, the result for CRISISUS, CO, INT, DIST EXVOL, ML, MCAP, GROWTH and GOV are also robust where the variables are not statistically significant. On the other hand, the result for RAR is significant in model (1) but not in model (2) and the result for WT and DIVER is significant in model (2) but not in model (1).

Table 6.14 Random effect OLS panel regressions exclude US markets

Dependent Variable =	Model (1) HB_FLOAT	Model (2) HB_ICAPM
ANNOUNCE	0.025	0.040**
	(-0.02)	(-0.01)
IMPLEMENT	0.002	0.027*
	(-0.03)	(-0.01)
CRISISUS	0.040	0.006
	(-0.02)	(-0.02)
CRISISEU	0.037**	0.021**
	(-0.01)	(-0.01)
WT	0.188	0.502***
	(-0.17)	(-0.13)
CO	-0.073	-0.056
	(-0.10)	(-0.07)
BILAT	-2.864**	-1.314***
	(-0.94)	(-0.40)
INT	-0.027	-0.144
	(-0.13)	(-0.12)
DIST	0.086	0.046
	(-0.08)	(-0.03)
EXVOL	0.000	0.000
	(0.00)	(0.00)
DIVER	0.093	0.124***
	(-0.09)	(-0.03)
RAR	-0.012*	-0.014
	(-0.01)	(-0.01)
ML	-0.04	-0.031
	(-0.04)	(-0.02)
MCAP	2.761	-1.716
	(-1.94)	(-0.94)
GROWTH	0.138	0.069
	(-0.12)	(-0.08)
GOV	-0.013	0.032
	(-0.06)	(-0.04)
CONSTANT	0.084	0.438
	(-0.72)	(-0.26)
Obs	208	208
R-square	0.55	0.71
Cluster Group	Yes	Yes

Note: The dependent variable is US equity Home Bias (HB). ANNOUNCE is dummy for stock market consolidation announcement period. IMPLEMENT is the dummy for stock market consolidation implement period. Next, CRISISUS is the dummy for the global financial crisis started in the US. CRISISEU is the dummy for the European debt crisis. WT is the withholding tax. CO is the capital account openness index. BILAT is the percentage of the bilateral trade between the US and the destination countries. INT is the percentage of the individual using the internet per population. DIST is the distance from capital to capital. EXVOL is exchange rate volatility. DIVER is the diversification opportunity of the destination countries. RAR is the risk adjusted return. ML is the equity market liquidity measure by the stock traded per GDP. MCAP is the market capitalization over GDP of the destination country's stock market. GROWTH is the growth in GDP per Capita. GOV is the WGI governance indicators. For interpretation, the statistical significance is reported against 10% (*), 5% (**) and 1% (***) significance level.

6.5 Discussion

6.5.1 Comparison of US HB

Consistent with the hypothesis, the stock market consolidation groups that contain emerging market country stock markets (MILA, ATL, CEESEG) seems to have a higher mean US HB comparing to those groups that contain developed country stock markets (NYSE-, NASDAQ-OMX, EURONEXT, LSE-BI). In addition, the mean US HB for the consolidation groups that exclude US stock markets (ATL, CEESEG, MILA) are higher than those of the group that include the US stock markets (NYSE-EURONEXT, NASDAQ-OMX).

This result is consistent when we look at the mean US HB for each stock market within the consolidation group that contain both developed and EM stock markets which are ATL and CEESEG. For ATL, the mean US HB for Malaysia which is EM country is higher than Singapore which is a developed country. For CEESEG, the mean US DB for the Czech Republic which is EM country is higher than Hungary and Austria which are developed countries.

This result is consistent with the previous literature where the degree of HB toward EM countries is higher than those of the developed country (Daly and Vo 2013; Mishra 2008; Ahearne et al. 2004).

6.5.2 Mean US HB in different stages

Consistent with the hypothesis, for the consolidation groups that include US stock markets, we found that the mean US HB decreases after ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage. This decrease is the effect of the fact that the US investors are now facilitated to trade stock with those stock markets. We also found that the mean US HB experience higher decrease during IMPLEMENT comparing to ANNOUNCE stage for NYSE-EURONEXT group as it is the stage where stock markets under the consolidation groups is allowed to trade under the common trading platform. Consistent with previous studies, there is evidence of an increase in foreign bias during the stock market consolidations (Giofré 2016).

For consolidation groups that exclude US stock markets, the mean US HB decreases for both ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage for most of the groups as the bigger consolidated markets make these stock markets more attractive to invest in. However, the mean US HB for MILA experience a slight increase in the IMPLEMENT stage as the US investors might be more interested in investing in its own group than investing in other groups.

6.5.3 Factors affecting US HB

For the consolidation group that include US stock markets, we found that there is no significant effect of ANNOUNCE and IMPLEMENT on US HB for both NYSE-EURONEXT and NASDAQ-OMX. This result is inconsistent with the hypothesis where ANNOUNCE and IMPLEMENT variables are expected to have a negative and significant effect on US HB. The result implies that stock market consolidation is not a significant factor that could reduce US HB. For the groups that exclude US stock markets, we found that there is a positive and significant effect of both ANNOUNCE and IMPLEMENT on US HB. This result is inconsistent with the hypothesis where ANNOUNCE and IMPLEMENT variables are expected to have a negative and significant effect on US HB. However, this result implies that US investors are even less interested in investing in other groups.

Since this study is the first to look at the effect of stock market consolidation on HB, we have to compare our results to the literature that examines similar variables. Giofré (2016) investigated the effect of the stock market consolidation on the degree of foreign bias for the countries under the consolidation group. The result suggests that the stock market consolidation has a positive and statistically significant effect on equity foreign bias of country under stock markets consolidation group. The result might seem to be inconsistent with our result. However, foreign bias measures the amount of foreign equity shares in the portfolio of each country which is a different measure from home bias from US investors perspective used in our study so the result could be different.

Second, we found that there is a negative and statistically significant effect of GOV, INT and BILAT on US HB. This result is consistent with the hypothesis as investors would want to invest in the country with better governance and less information cost. Our results are

consistent with many previous studies which also found that these variables have a statistically significant impact on HB. Similar to our study, Chan et al. (2005), Fidora et al. (2007) and Daly and Vo (2013) found that GOV is a significant factor that explains US HB while Dahlquist et al. (2003) found it to be insignificant. In addition, Mishra (2008) also found INT to be a significant variable that affect HB. Consistent with our study, many studies also found BILAT to be a significant variable (Baele et al. 2007; Mishra 2008; Mishra 2014) while Fidora et al. (2007) found it to be insignificant.

Third, there is a positive and statistically significant effect of EXVOL, WT and CRISISEU on US HB. This result is consistent with the hypothesis as US investors would want to invest in the country with lower exchange rate volatility, lower withholding tax of dividend yield and not during the financial crisis period of the destination countries. Our results are consistent with many previous studies which also found that these variables have a statistically significant impact on HB. Similar to our study, many studies found EXVOL to be a significant factor that affect HB (Fidora et al. 2007; Mishra 2014; Daly and Vo 2013). In addition, many studies found WT to be a significant factor (Stulz 1981; Cooper and Kaplanis 1986; Mishra 2014) while Chan et al. (2005) found it to be insignificant.

Next, there is a positive and statistically significant effect of GROWTH, CO and DIVER on US HB. This result is inconsistent with the hypothesis as US investors would want to invest in the country with higher economic growth, capital account openness and diversification benefit. However, the result implies that US HB is higher toward the EM countries with the characteristic of high growth and high diversification benefit. For capital account openness, the result implies that US HB is higher toward the country with higher CO. Furthermore, there is a negative and significant effect of DIST on US HB. This result is inconsistent with the hypothesis as a higher distance is believed to increase information cost.

Fidora et al. (2007) and Anderson et al. (2011) found GROWTH to be a significant factor that affect HB while Dahlquist et al. (2003) and Chan et al. (2005) found it to be insignificant. Similar to our study, Ahearne et al. (2004) and Daly and Vo (2013) found that CO is a significant factor that affect HB while Chan et al. (2005) found it to be insignificant. Similar to our study, DIVER is found to have a significant effect on equity home bias by many studies (Fidora et al. 2007; Mishra 2014; Mishra 2008b) while Chan et al. (2005) found

it to be insignificant. Consistent with our study, Portes and Rey (2005) showed that the distance between capital and capital has a positive and significant effect on home bias.

Finally, we found that CRISISUS, RAR, ML, MCAP do not have a statistically significant effect on US HB. This result is inconsistent with the hypothesis as US investors would want to invest more in the country with higher incentive of investing and invest less during the financial crisis. Similar to our study, many studies also found RAR to be an insignificant factor that affect HB (Daly and Vo 2013; Ahearne et al. 2004; Mishra 2008). However, Chan et al. (2005) and Daly and Vo (2013) found that equity market liquidity has a negative and significant effect on equity home bias. Consistent with our study, Dahlquist et al. (2003) and Daly and Vo (2013) found MCAP to be an insignificant factor that affect HB while Chan et al. (2005) and Anderson et al. (2011) and Mishra (2014) found it to be significant.

6.6 Conclusion

Due to the recent trends of stock market consolidations around the world, we are interested in investigating whether this event has a significant effect on US HB. While the degree of HB has been widely studied, none of the previous studies have examined the effect of the stock market consolidation on US HB. We decompose stages of stock market consolidation into ANNOUNCE and IMPLEMENT period to distinguish the effect from each period. The first objective is to compare US HB between six stock market consolidation groups. The second objective is to compare mean US HB in different stages. Finally, the third objective is to examine the factors affecting US HB especially the effect of ANNOUNCE and IMPLEMENT on US HB controlling for other control variables.

Following the first objective, we compare the mean US HB for six stock market consolidation groups in our sample during the year 2001-2016. Consistent with the hypothesis, the stock market consolidation groups that contain emerging market country stock markets (MILA, ATL, CEESEG) seems to have a higher mean US HB comparing to those groups that contain developed country stock markets (NYSE-, NASDAQ-OMX, EURONEXT, LSE-BI). In addition, the mean US HB for the consolidation groups that exclude US stock markets (ATL, CEESEG, MILA) are higher than those of the group that include the US stock markets (NYSE-EURONEXT, NASDAQ-OMX).

To answer the second objective, we compare the mean US HB for six stock market consolidation groups in the pre-announce, ANNOUNCE and IMPLEMENT stages. Consistent with the hypothesis, for the consolidation groups that include US stock markets, we found that the mean US HB decreases after ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage. This decrease is the effect of the fact that the US investors are now facilitated to trade stock with those stock markets. We also found that the mean US HB experience higher decrease during IMPLEMENT comparing to ANNOUNCE stage for NYSE-EURONEXT group as it is the stage where stock markets under the consolidation groups is allowed to trade under the common trading platform.

For consolidation groups that exclude US stock markets, the mean US HB decreases for both ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage for most of the groups as the bigger consolidated markets make these stock markets more attractive to invest in. However, the mean US HB for MILA experience a slight increase in the

IMPLEMENT stage as the US investors might be more interested in investing in its own group than investing in other groups.

According to the third objective, we examine the factors affecting US HB especially the effect of ANNOUNCE and IMPLEMENT on US HB controlling for other control variables. For the consolidation group that include US stock markets, we found that there is no significant effect of ANNOUNCE and IMPLEMENT on US HB for both NYSE-EURONEXT and NASDAQ-OMX. This result is inconsistent with the hypothesis where ANNOUNCE and IMPLEMENT variables are expected to have a negative and significant effect on US HB. The result implies that stock market consolidation is not a significant factor that could reduce US HB. For the groups that exclude US stock markets, we found that there is a positive and significant effect of both ANNOUNCE and IMPLEMENT on US HB. This result is inconsistent with the hypothesis where ANNOUNCE and IMPLEMENT variables are expected to have a negative and significant effect on US HB. However, this result implies that US investors are even less interested in investing in other groups.

For the other control variables, GOV, INT and BILAT and DIST have a negative and significant impact on US HB while EXVOL, WT, CRISISEU, GROWTH, CO and DIVER have a positive and significant impact on US HB. However, CRISISUS, RAR, ML, MCAP do not have a statistically significant effect on US HB.

Chapter 7: Conclusion

7.1 Summary of Empirical Findings

7.1.1 Stock Market Integration

First, we found that the stock market consolidation groups that contain developed country stock markets (LSE-BI, NYSE-EURONEXT, NASDAQ-OMX) seems to have a higher mean MI compared to those groups that contain emerging market country stock markets (ATL, CEESEG, MILA).

Second, we found that mean MI increased for the ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage for all the consolidation group. The change of mean MI of ANNOUNCE and IMPLEMENT stages from the pre-announce stage seems to be higher for the stock market consolidation groups that contain emerging market countries stock market (ATL, CEESEG, MILA) comparing to those groups that contain developed countries stock markets (LSE-BI, NYSE-EURONEXT, NASDAQ-OMX).

Third, we found that there is a positive and statistically significant effect of ANNOUNCE and IMPLEMENT on MI with ANNOUNCE having higher impact than IMPLEMENT reflecting that the effect from investors' speculation is higher than the effect from real trading activity. For the other control variables, CRISISUS and CRISISEU and REALRATE have a positive and significant impact on MI while EXVOL, TERM, DY, VOL, TRADE and MD have a negative and significant impact on MI. However, JAN, GROWTH and IFL do not have a statistically significant effect on MI.

7.1.2 Diversification Benefit

First, we found that the stock market consolidation groups that contain emerging market country stock markets (ATL, CEESEG, MILA) have a higher mean US DB comparing to those groups that contain developed country stock markets (LSE-BI, NYSE-EURONEXT, NASDAQ-OMX). In addition, the mean US DB for the consolidation groups that exclude US stock markets (NYSE-EURONEXT, NASDAQ-OMX) are higher than those of the group that include the US stock markets (ATL, CEESEG, MILA, LSE-BI).

Second, for the consolidation group that include US stock markets, we found that mean US DB decreased for the ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage. We also found that the mean US DB experience higher decrease during IMPLEMENT comparing to ANNOUNCE stage as it is the stage where stock markets under the consolidation groups is allowed to trade under the common trading platform. For consolidation groups that exclude US stock markets, the mean US DB decreases for both ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage for most of the groups except LSE-BI that experience slight increase in the ANNOUNCE stage before it decreases in the IMPLEMENT stage.

Third, for the consolidation group that includes US stock markets, this result is consistent with the hypothesis where ANNOUNCE and IMPLEMENT variable are expected to have a negative effect on US DB. For the groups that exclude US stock markets, we found that there is a positive and significant effect of IMPLEMENT on US DB which is consistent with the hypothesis. This result implies that US stock markets become more integrated with its own group but less integrated with other groups.

For the other control variables, REALRATE, VOL, TERM, MD and DY have a positive and significant impact on US DB while CRISISUS, CRISISEU, EXVOL and GROWTH have a negative and significant impact on US DB. However, JAN, TRADE and IFL do not have a statistically significant effect on US DB.

7.1.3 Home Bias

First, the stock market consolidation groups that contain emerging market country stock markets (MILA, ATL, CEESEG) have a higher mean US HB comparing to those groups that contain developed country stock markets (NYSE-, NASDAQ-OMX, EURONEXT, LSE-BI). In addition, the mean US HB for the consolidation groups that exclude US stock markets (ATL, CEESEG, MILA) are higher than those of the group that include the US stock markets (NYSE-EURONEXT, NASDAQ-OMX).

Second, for the consolidation groups that include US stock markets, we found that the mean US HB decreases after ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage. This decrease is the effect of the fact that the US investors are now

facilitated to trade stock with those stock markets. We also found that the mean US HB experience higher decrease during IMPLEMENT comparing to ANNOUNCE stage for NYSE-EURONEXT group as it is the stage where stock markets under the consolidation groups is allowed to trade under the common trading platform.

For consolidation groups that exclude US stock markets, the mean US HB decreases for both ANNOUNCE and IMPLEMENT stages comparing to the pre-announce stage for most of the groups as the bigger consolidated markets make these stock markets more attractive to invest in. However, the mean US HB for MILA experience a slight increase in the IMPLEMENT stage as the US investors might be more interested in investing in its own group than investing in other groups.

Third, for the consolidation group that include US stock markets, we found that there is no significant effect of ANNOUNCE and IMPLEMENT on US HB for both NYSE-EURONEXT and NASDAQ-OMX. This result is inconsistent with the hypothesis where ANNOUNCE and IMPLEMENT variables are expected to have a negative and significant effect on US HB. The result implies that stock market consolidation is not a significant factor that could reduce US HB. For the groups that exclude US stock markets, we found that there is a positive and significant effect of both ANNOUNCE and IMPLEMENT on US HB. This result is inconsistent with the hypothesis where ANNOUNCE and IMPLEMENT variables are expected to have a negative and significant effect on US HB. However, this result implies that US investors are even less interested in investing in other groups.

For the other control variables, GOV, INT and BILAT and DIST have a negative and significant impact on US HB while EXVOL, WT, CRISISEU, GROWTH, CO and DIVER have a positive and significant impact on US HB. However, CRISISUS, RAR, ML, MCAP do not have a statistically significant effect on US HB.

7.1.4 Overall

All in all, the result from all the three empirical essays implies that the stock market consolidation significantly increases the stock market integration for many stock markets around the world. From the US investors perspective, the stock market consolidation decreases their diversification benefit toward the consolidation group that include US stock

markets. However, the diversification benefit for the US investors still exist in the consolidation group that exclude the US stock markets implying that the US markets are more integrated with its own consolidation group but less integrated with others. When looking at the US investors real equity investment activity, the stock market consolidation does not significantly decrease the US equity home bias even for the consolidation group that include the US stock markets. The stock market consolidation even statistically increases the US home bias toward the consolidation group that exclude the US stock markets.

7.2 Managerial Implications

There are different types of investors in the stock markets. Firstly, we can classify them by size. Most of the big one is the institutional investors who manage the institution's and the customer's portfolio. Most of the small one is the retail investors who manage their own portfolio. Secondly, we can classify them by their investment behaviour. Speculative investors buy a stock expecting that the price will go up or down quickly while value investors buy a stock after determining the long-term value of the business.

According to our result, the US institutional and retail investors should decrease their home bias and invest more in the stock markets under consolidation groups that exclude the US stock market to gain diversification benefit. They should take into account difference in real interest rate, stock market return volatility, term structure of interest rate, stock market development, dividend yield, exchange rate volatility and economic growth before making investment decision as our result suggests that they statistically significantly affect US DB.

The result from the NYSE-EURONEXT group implies that the speculative investors react to the stock market news and buy stock during the ANNOUNCE period. On the other hand, the result from the NASDAQ-OMX group implies that the value investors react less to the stock market news and buy stock during the IMPLEMENT period.

7.3 Public Policy Recommendations

The result suggests that policymakers should urge to consolidate the stock markets so that the investors are more facilitated to decrease home bias and increase diversification benefit. The stock market consolidation successfully increases the degree of MI both in the announce and implement period. We found a negative and statistically significant effect of difference in exchange rate volatility, market development, dividend yield, stock market return volatility, trade openness and term structure of interest rate on MI which is consistent with the hypothesis since the higher the difference reflects the deviation in the stage of economy.

As expected, the US investors diversification benefit decrease among the consolidation groups that include US stock market. On the other hand, the US investors diversification benefit still exist among the consolidation groups that exclude US stock markets. However, there is no evidence that the US investors significantly decreases home bias towards the consolidation groups that include US markets after the stock market consolidation.

US home bias even increase toward the consolidation groups that exclude US markets suggesting that there is still room for the policymakers to reduce investment barrier so that US investors can invest more in these countries to reap existing diversification benefit. We found that there is a negative and statistically significant effect of governance, internet and bilateral trade on US HB. On the other hand, there is a positive and statistically significant effect of exchange rate volatility, withholding tax and European debt crisis on US HB.

7.4 Limitation

For MI and DB analysis, the limitation is that the data of the price index and other control variables for Estonia, Iceland, Chile and Slovenia are not available on a monthly basis. Therefore, the observations of these four countries are dropped from the sample. Future studies can include these four stock markets into the analysis using the yearly data and compare the result with this study.

For HB analysis, the limitation is that the holding data used to calculate HB is only collected on an annual basis. Therefore, we cannot conduct the analysis on a higher frequency data to gain more observations. However, IMF started to report the holding data on a semi-annual basis since the year 2013. Thus, future study will now have more observations to conduct the analysis for the effect of the upcoming stock market consolidations on home bias.

7.5 Suggestion for further studies

The suggestion for further study would be to conduct the analysis by looking through the perspective of other countries' investors beside US investors. As we use the data from the US investors perspective for DB and HB chapters, we might be able to generalize the findings of these two chapters for other countries with similar level of the development.

However, it is more difficult to generalize these findings for emerging countries with different level of development reflected by the macro variables. Therefore, it is left for future study to conduct the analysis from the perspective of emerging markets.

Appendix

Appendix A: Differences between price-based and quantity-based indicators

Table A-1 Differences between price-based and quantity-based indicators

	Price-based indicators	Quantity-based indicators
Stock market price index data	☑	
Capital flows data		☑
Data availability	☑	
Data reliability	☑	
High data frequency	☑	
Economic meaning	☑	
Follow law of one price	☑	

Note: Table A-1 compares the characteristics of the price-based and quantity-based indicators

Appendix B: OLS model robustness check

Table B-1 Ramsey RESET test for MI empirical essay

Test	P-value
Ramsey RESET test	0.00

Note: Table B-1 shows that there is no omitted variable bias

Table B- 2 Breusch-Pagan test for MI empirical essay

Test	P-value
Breusch-Pagan test	0.00

Note: Table B-2 shows that random effect is preferred to pool OLS model

Table B- 3 Hausman test for MI empirical essay

Test	P-value
Hausman test	0.00

Note: Table B-3 shows that fixed effect is preferred to random effect model

Table B- 4 Ramsey RESET test for DB empirical essay

Test	P-value
Ramsey RESET test	0.00

Note: Table B-4 shows that there is no omitted variable bias

Table B- 5 Breusch-Pagan test for DB empirical essay

Test	P-value
Breusch-Pagan test	0.00

Note: Table B-5 shows that random effect is preferred to pool OLS model

Table B- 6 Hausman test for DB empirical essay

Test	P-value
Hausman test	0.00

Note: Table B-6 shows that fixed effect is preferred to random effect model

Table B- 7 Ramsey RESET test for HB empirical essay

Test	P-value
Ramsey RESET test	0.00

Note: Table B-7 shows that there is no omitted variable bias

Table B- 8 Breusch-Pagan test for HB empirical essay

Test	P-value
Breusch-Pagan test	0.00

Note: Table B-8 shows that random effect is preferred to pool OLS model

Table B- 9 Hausman test for HB empirical essay

Test	P-value
Hausman test	0.48

Note: Table B-9 shows that fixed effect is preferred to random effect model

Appendix C: Statistical test of difference in mean for ANNOUNCE and IMPLEMENT effect on MI

Table C- 1 Statistical test of difference in mean for ANNOUNCE and IMPLEMENT effect on MI

Test	P-value
H_0: $\mu_1 - \mu_2 >= 0$ H_a: $\mu_1 - \mu_2 < 0$	0.00

Note: Table C-1 shows that ANNOUNCE has a statistically significant more impact than IMPLMENT on MI

Appendix D: Destination countries for DB and HB analysis

Table D- 1 Destination countries for DB empirical essays

Consolidation Group	Stock Market Index	Announcement	Implement
NYSE-EURONEXT	Amsterdam Stock Exchange (Netherland)	September 2000	November 2003
	Brussels Stock Exchange (Belgium)	September 2000	November 2003
	Paris Stock Exchange (France)	September 2000	November 2003
	Lisbon Stock Exchange (Portugal)	February 2002	November 2003
NASDAQ- OMX	Stockholm Stock Exchange (Sweden)	May 2003	September 2004
	Helsinki Stock Exchange (Finland)	May 2003	September 2004
	Copenhagen Stock Exchange (Denmark)	November 2004	February 2005
LSE-BI	London Stock Exchange (UK)	June 2007	October 2007
	Italian Stock Exchange (Italy)	June 2007	October 2007
CEESEG	Budapest Stock Exchange (Hungary)	November 2008	January 2010
	Prague Stock Exchange (Czech Republic)	November 2008	January 2010
	Vienna Stock Exchange (Austria)	November 2008	January 2010
MILA	Lima Stock Exchange (Peru)	September 2009	May 2011
	Colombia Stock Exchange (Colombia)	September 2009	May 2011
	Mexican Stock Exchange (Mexico)	July 2014	December 2014
ATL	Bursa Malaysia (Malaysia)	April 2011	September 2012
	Singapore Exchange (Singapore)	April 2011	September 2012
	Stock Exchange of Thailand (Thailand)	April 2011	October 2012

Note: Table D-1 summarizes the timeline for the stock market consolidation announcement and implement date for each sample stock market indices under each consolidation group.

Table D- 2 Destination countries for HB empirical essays

Consolidation Group	Stock Market Index	Announcement	Implement
NYSE-EURONEXT	Amsterdam Stock Exchange (Netherland)	September 2000	November 2003
	Brussels Stock Exchange (Belgium)	September 2000	November 2003
	Paris Stock Exchange (France)	September 2000	November 2003
	Lisbon Stock Exchange (Portugal)	February 2002	November 2003
NASDAQ- OMX	Stockholm Stock Exchange (Sweden)	May 2003	September 2004
	Helsinki Stock Exchange (Finland)	May 2003	September 2004
	Estonia Stock Exchange (Estonia)	May 2003	September 2004
	Copenhagen Stock Exchange (Denmark)	November 2004	February 2005
	Iceland Stock Exchange (Iceland)	September 2006	April 2007
LSE-BI	London Stock Exchange (UK)	June 2007	October 2007
	Italian Stock Exchange (Italy)	June 2007	October 2007
CEESEG	Budapest Stock Exchange (Hungary)	November 2008	January 2010
	Ljubljana Stock Exchange (Slovenia)	November 2008	January 2010
	Prague Stock Exchange (Czech Republic)	November 2008	January 2010
	Vienna Stock Exchange (Austria)	November 2008	January 2010
MILA	Lima Stock Exchange (Peru)	September 2009	May 2011
	Colombia Stock Exchange (Colombia)	September 2009	May 2011
	Chile Stock Exchange (Chile)	September 2009	May 2011
	Mexican Stock Exchange (Mexico)	July 2014	December 2014
ATL	Bursa Malaysia (Malaysia)	April 2011	September 2012
	Singapore Exchange (Singapore)	April 2011	September 2012
	Stock Exchange of Thailand (Thailand)	April 2011	October 2012

Note: Table D-2 summarizes the timeline for the stock market consolidation announcement and implement date for each sample stock market indices under each consolidation group.

Bibliography

Adam, K., Jappelli, T., and Menichini, A., 2002. Analyse , Compare , and Apply Alternative Indicators and Monitoring Methodologies to Measure the Evolution of Capital Market Integration in the European Union Mario Padula , Marco Pagano Department of Economics and Statistics. *Assessment*, (January).

Ahearne, A.G., Griever, W.L., and Warnock, F.E., 2004a. Information costs and home bias: an analysis of US holdings of foreign equities. *Journal of international economics*, 62(2), pp.313–336.

Ahearne, A.G., Griever, W.L., and Warnock, F.E., 2004b. Information costs and home bias: an analysis of US holdings of foreign equities. *Journal of international economics*, 62(2), pp.313–336.

Anderson, C.W., Fedenia, M., Hirschey, M., and Skiba, H., 2011. Cultural influences on home bias and international diversification by institutional investors. *Journal of Banking & Finance*, 35(4), pp.916–934.

Arouri, M.E.H., Nguyen, D.K., and Pukthuanthong, K., 2012. An international CAPM for partially integrated markets: Theory and empirical evidence. *Journal of Banking and Finance*, 36(9), pp.2473–2493.

Arshanapalli, B., Doukas, J., and Lang, L.H.P., 1995. Pre and post-October 1987 stock market linkages between U.S. and Asian markets. *Pacific-Basin Finance Journal*, 3(1), pp.57–73.

Azali, M., Habibullah, M.S., and Matthews, K.G., 2010. Financial integration and the ASEAN-5 equity markets Financial integration and the ASEAN-5 equity markets. , 6846(June 2015), pp.37–41.

Baele, L., Ferrando, A., Hördahl, P., Krylova, E., and Monnet, C., 2004. Measuring financial integration in the euro area. *ECB Occasional Paper*, April.

Baele, L., Pungulescu, C., and Ter Horst, J., 2007a. Model uncertainty, financial market integration and the home bias puzzle. *Journal of International Money and Finance*, 26(4), pp.606–630.

Baele, L., Pungulescu, C., and Ter Horst, J., 2007b. Model uncertainty, financial market integration and the home bias puzzle. *Journal of International Money and Finance*, 26(4), pp.606–630.

Baillie, R.T., Bollerslev, T., and Mikkelsen, H.O., 1996. Fractionally integrated generalized autoregressive conditional heteroskedasticity. *Journal of Econometrics*,

74(1), pp.3–30.

Bartram, S.M. and Dufey, G., 2001. International Portfolio Investment: Theory, Evidence, and Institutional Framework. *Financial Markets, Institutions & Instruments*, 10(3), pp.85–155.

Bekaert, G. and Harvey, C.R., 1995. Time-varying world market integration. *The Journal of Finance*, 50(2), pp.403–444.

Bekaert, G., Harvey, C.R., Lundblad, C.T., and Siegel, S., 2011. What segments equity markets? *Review of Financial Studies*, 24(12), pp.3841–3890.

Bekaert, G., Hodrick, R.J., Zhang, X., The, S., and Dec, N., 2009. International Stock Return Comovements. *Journal of Finance*, 64(6), pp.2591–2626.

Bekaert, G. and Urias, M.S., 1996. Diversification, integration and emerging market closed-end funds. *The journal of finance*, 51(3), pp.835–869.

Bekaert, G. and Wang, X.S., 2009. Home bias revisited. *Available at SSRN 1344880*.

Billio, M., Donadelli, M., Paradiso, A., and Riedel, M., 2017. Which market integration measure? *Journal of Banking & Finance*, 76, pp.150–174.

Bit-kun, Y., Arsad, Z., and Chee-Wooi, H., 2015. Modeling Time-Varying Stock Market Integration in ASEAN: A Kalman Filter Approach. *International Journal of Economics & Management*, 9(2), pp.232–247.

Boubakri, S. and Guillaumin, C., 2011. Financial integration and currency risk premium in CEECs: Evidence from the ICAPM. *Emerging Markets Review*, 12(4), pp.460–484.

Bracker, K. and Koch, P.D., 1999. Economic determinants of the correlation structure across international equity markets. *Journal of Economics and Business*, 51(6), pp.443–471.

Buttner, D. and Hayo, B., 2011. Determinants of European stock market integration. *Economic Systems*, 35, pp.574–585.

Carrieri, F., Chaieb, I., and Errunza, V., 2013. Do implicit barriers matter for globalization? *Review of Financial Studies*, 26(7), pp.1694–1739.

Chan, K., Covrig, V., and Ng, L., 2005. What determines the domestic bias and foreign bias? Evidence from mutual fund equity allocations worldwide. *The journal of finance*, 60(3), pp.1495–1534.

Chan, K., Covrig, V., and Ng, L., 2009. Does home bias affect firm value? Evidence from holdings of mutual funds worldwide. *Journal of international economics*, 78(2), pp.230–241.

Christoffersen, P., Errunza, V., Jacobs, K., and Jin, X., 2014. Correlation dynamics and

international diversification benefits. *International Journal of Forecasting*, 30(3), pp.807–824.

Click, R.W. and Plummer, M.G., 2005. Stock market integration in ASEAN after the Asian financial crisis. *Journal of Asian Economics*, 16(1), pp.5–28.

Cooper, I., 2013. The Equity Home Bias Puzzle: A Survey. *Foundations and Trends® in Finance*, 7(4), pp.289–416.

Cooper, I. and Kaplanis, E., 1986. Costs to crossborder investment and international equity market equilibrium. *Recent Developments in Corporate Finance Cambridge University Press*, pp.209–240.

Cooper, I. and Kaplanis, E., 1994. Home bias in equity portfolios, inflation hedging, and international capital market equilibrium. *Review of Financial Studies*, 7(1), pp.45–60.

Cotter, J., Gabriel, S., and Roll, R., 2018. Nowhere to Run, Nowhere to Hide: Asset Diversification in a Flat World. *Ssrn*.

Cybo-Ottone, A., Di Noia, C., and Murgia, M., 2000. Recent Development in the Structure of Securities Markets. *Brookings-Wharton Papers on Financial Services*, 2000(1), pp.223–273.

Dahlquist, M., Pinkowitz, L., Stulz, R.M., and Williamson, R., 2003. Corporate Governance and the Home Bias. *The Journal of Financial and Quantitative Analysis*, 38(1), pp.87–110.

Daly, K. and Vo, X.V., 2013. The determinants of home bias puzzle in equity portfolio investment in Australia. *International Review of Financial Analysis*, 27, pp.34–42.

Delcoure, N., 2010. Diversification Benefits: Correlation and Return Gaps. *International Review of Applied Financial Issues and Economics*, 2(3), pp.597–607.

Dimitrios, D. and Simos, T., 2011. Monetary Union effects on European stock market integration: An international CAPM approach with currency risk. *Munich Personal RePEc Archive*, (37477).

Dimitriou, D. and Simos, T., 2013. International portfolio diversification: an ICAPM approach with currency risk. *Macroeconomics and Finance in Emerging Market Economies*, 6(2), pp.177–189.

Dorodnykh, E., 2014. Determinants of stock exchange integration: evidence in worldwide perspective. *Journal of Economic Studies*, 41(2), pp.292–316.

Driessen, J. and Laeven, L., 2007. International portfolio diversification benefits: Cross-country evidence from a local perspective. *Journal of Banking & Finance*, 31(6), pp.1693–1712.

Engle, R. and Robert, E., 2002. Dynamic Conditional Correlation Dynamic Conditional Correlation : A Simple Class of Multivariate Generalized Autoregressive Conditional Heteroskedasticity Models. , pp.339–350.

Erb, C.B., Harvey, C.R., and Viskanta, T.E., 1994. Forecasting International Equity Correlations. *Financial Analysts Journal*, 50(6), pp.32–45.

Fidora, M., Fratzscher, M., and Thimann, C., 2007. Home bias in global bond and equity markets: the role of real exchange rate volatility. *Journal of International Money and Finance*, 26(4), pp.631–655.

French, K.R. and Poterba, J.M., 1991. Investor Diversification and International Equity Markets. *The American Economic Review*, 81(2), pp.222–226.

Giofré, M., 2016. Stock exchange consolidation and cross-border investment: an empirical assessment. *SSRN Electronic Journal*, (October), pp.1–33.

Goetzmann, W.N., Lingfeng, L., and Rouwenhorst, K.G., 2004. Long - Term Global Market Correlations Long-Term Global Market Correlations. *Yale ICF Working Paper*, No . 08 -(08), p.46.

Grout, P.A. and Zalewska, A., 2006. The impact of regulation on market risk. *Journal of Financial Economics*, 80(1), pp.149–184.

Grubel, H.G.., 1968. Internationally Diversified Portfolios : Welfare Gains and Capital Flows. *The American Economic Review*, 58(5), pp.1299–1314.

Guesmi, K., Moisseron, J.Y., and Teulon, F., 2014. Integration versus segmentation in Middle East North Africa Equity Market: Time variations and currency risk. *Journal of International Financial Markets, Institutions and Money*, 28(1), pp.204–212.

Guesmi, K. and Nguyen, D.K., 2014. Time-varying regional integration of stock markets in Southeast Europe. *Applied Economics*, 46(11), pp.1279–1290.

Guesmi, K., Nguyen, D.K., and Teulon, F., 2006. Further evidence on the determinants of regional stock market integration in Latin America. *The European Journal of Comparative Economics*, 10, pp.397–413.

Harvey, C.R., 1995. Predictable Risk and Returns in Emerging Markets. *The Review of Financial Studies*, 8(3), pp.773–816.

Huberman, G. and Kandel, S., 1987. Mean-variance spanning. *The journal of finance*, 42(4), pp.873–888.

Hwang, J.-K., 2012. Dynamic Correlation Analysis of Asian Stock Markets. *International Advances in Economic Research*, 18(2), pp.227–237.

Jiang, Y., Nie, H., and Monginsidi, J.Y., 2017. Co-movement of ASEAN stock markets:

New evidence from wavelet and VMD-based copula tests. *Economic Modelling*, 64, pp.384–398.

Karim, B.A. and Karim, Z.A., 2012. Integration of ASEAN-5 Stock Markets: a revisit. *Asian Academy of Management Journal of Accounting & Finance*, 8(2), pp.21–41.

Kearney, C. and Lucey, B.M., 2004. International equity market integration: Theory, evidence and implications. *International Review of Financial Analysis*, 13(5 SPEC.ISS.), pp.571–583.

Kim, S.J., Moshirian, F., and Wu, E., 2006. Evolution of international stock and bond market integration: Influence of the European Monetary Union. *Journal of Banking and Finance*, 30(5), pp.1507–1534.

Kolluri, B., Machuga, S., and Wahab, M., 2014. Co-Movements of US and Asian Equity Markets: Evidence from Asymmetric and Time-Varying Coefficients. *Review of Pacific Basin Financial Markets & Policies*, 17(4), p.1.

Lau, S.T., Ng, L., and Zhang, B., 2010. The world price of home bias. *Journal of Financial Economics*, 97(2), pp.191–217.

Lee, H.-C., Hsu, C.-H., and Lee, Y.-H., 2016. Location of trade, return comovements, and diversification benefits: Evidence from Asian country ETFs. *North American Journal of Economics & Finance*, 37, pp.279–296.

Leepsa, N.M. and Mishra, C.S., 2016. Theory and Practice of Mergers and Acquisitions: Empirical Evidence from Indian Cases. *IIMS Journal of Management Science*, 7(2), p.179.

Lessard, D.R.., 1973. International Portfolio Diversification : A Multivariate Analysis for a Group of Latin American Countries. *The Journal of Finance*, 28(3), pp.619–633.

Levy, H. and Sarnat, M., 1970. International Diversification of Investment Portfolios. *The American Economic Review*, 60(4), pp.668–675.

Lim, L.K., 2009. Convergence and interdependence between ASEAN-5 stock markets. *Mathematics and Computers in Simulation*, 79(9), pp.2957–2966.

Lintner, J., 1965. The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets. *The review of economics and statistics*, 47(1), pp.13–37.

Longin, F. and Solnik, B., 2001. Correlation Structure of International Equity Markets. *The Journal of Finance*, LVI(2), pp.649–676.

Markowitz, H., 1952. Portfolio selection. *The journal of finance*, 7(1), pp.77–91.

Markowitz, H., 1959. *Portfolio selection: efficient diversification of investments*. New

York: Wiley.

Meric, G., Welsh, C.N., and Weidman, S.M., 2008. Returns and Co-Movements Of Domestic and Country Index Funds: Global Portfolio Diversification Implications. *Journal of Global Business Issues*, 2(2), pp.115–125.

Meric, I., Gishlick, H.E., Taga, L.S., and Meric, G., 2011. Risks, Returns, and Portfolio Diversification Benefits of Country Index Funds in Bear and Bull Markets. *Business & Economics Research Journal*, 2(1), pp.1–14.

Miralles-Marcelo, J.L., Miralles-Quirós, M. del M., and Miralles-Quirós, J.L., 2015. Improving international diversification benefits for US investors. *North American Journal of Economics & Finance*, 32, pp.64–76.

Mishra, A. V., 2008a. Australia's equity home bias. *Australian Economic Papers*, 47(1), pp.53–73.

Mishra, A. V., 2008b. Australia's equity home bias. *Australian Economic Papers*, 47(1), pp.53–73.

Mishra, A. V, 2014. Australia's home bias and cross border taxation. *Global Finance Journal*, 25(2), pp.108–123.

Mishra, A. V, 2015. Measures of equity home bias puzzle. *Journal of empirical finance*, 34, pp.293–312.

Mossin, J., 1966. Equilibrium in a Capital Asset Market. *Econometrica*, 34(4), pp.768–783.

Mukherjee, K.; R.K.M., 2007. International Stock Market Integration and Its Economic Determinants: A study of Indian and World Equity Market.

Portes, R. and Rey, H., 2005. The determinants of cross-border equity flows. *Journal of International Economics*, 65(2), pp.269–296.

Pretorius, E., 2002. Economic determinants of emerging stock market interdependence. *Emerging Markets Review*, 3(1), pp.84–105.

Pukthuanthong, K. and Roll, R., 2009. Global market integration : An alternative measure and its application $. *Journal of Financial Economics*, 94(2), pp.214–232.

Quinn, D.P. and Voth, H.-J., 2008. A Century of Global Equity Market Correlations. *American Economic Review*, 98(2), pp.535–540.

Rajan, M. and Friedman, J., 1997. An examination of the impact of country risk on the international portfolio selection decision. *Global Finance Journal*, 8(1), pp.55–70.

De Roon, F.A., Nijman, T.E., and Werker, B.J.M., 2001. Testing for mean-variance spanning with short sales constraints and transaction costs: The case of emerging

markets. *The journal of finance*, 56(2), pp.721–742.

Schmiedel, H. and Schönenberger, A., 2005. Integration of securities market infrastructures in the euro area. *ECB Occasional Paper*, July.

Serafie, H. El and Shahid, S.F.A., 2002. World Stock Exchanges are integrating/consolidating/merging: what could be done by Arab Exchanges? , 52(1), pp.1–5.

Sercu, P., 1980. A generalisation of the international asset pricing model. *Revue de l'Association Française de Finance*, 1(1), pp.91–135.

Sercu, P. and Vanpée, R., 2008. Estimating the Costs of International Equity Investments*. *Review of Finance*, 12(4), pp.587–634.

Sharpe, W.F., 1964. Capital asset prices: a theory of market equilibrium under conditions of risk. *Journal of Finance*, 19(3), pp.425–442.

Solnik, B., 1974. An Equilibrium Model of the International Capital Market. *Journal of Economic Theory*, 8(4), pp.500–524.

Statman, M. and Scheid, J., 2008. Correlation, Return Gaps, and the Benefits of Diversification. *Journal of Portfolio Management*, (January 2007), pp.132–140.

Stulz, R.M., 1981. On the Effects of Barriers to International Investment. *The Journal of Finance*, 18(2), pp.264–272.

Stulz, R.M., 1999. International Portfolio Flows and Security Markets. *SSRN Electronic Journal*, (August).

Thanakijsombat, T. and Kongtoranin, T., 2018. Performance and diversification benefits of foreign-equity ETFs in emerging markets. *Applied Economics Letters*, 25(2), pp.125–129.

Valdes, R., Von Cramon-Taubadel, S., and Engler, A., 2016. What drives stock market integration? An analysis using agribusiness stocks. *Agricultural Economics*, 47(5), pp.571–580.

Volosovych, V., 2011. Measuring financial market integration over the long run: Is there a U-shape? *Journal of International Money and Finance*, 30(7), pp.1535–1561.

Wolfe, M., Stressman, S., and Manfredo, M., 2011. The acquisition of IBP by tyson foods in 2001: Pre- and post-merger financial performance. *American Journal of Agricultural Economics*, 93(2), pp.642–647.